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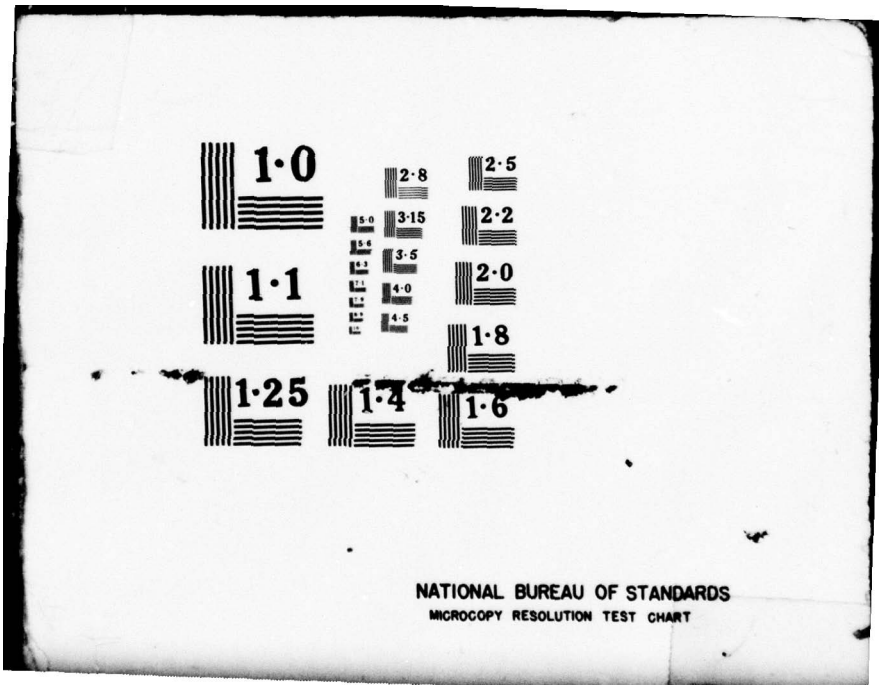
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AGARD

ADVISORY GROUP FOR AEROSPACE RESEARCH & DEVELOPMENT

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AGARD BULLETIN

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THE MISSION OF AGARD

The mission of AGARD is to bring together the leading personalities of the NATO nations in the fields of science and technology relating to aerospace for the following purposes:

- Exchanging of scientific and technical information;
- Continuously stimulating advances in the aerospace sciences relevant to strengthening the common defence posture;
- Improving the co-operation among member nations in aerospace research and development;
- Providing scientific and technical advice and assistance to the North Atlantic Military Committee in the field of aerospace research and development;
- Rendering scientific and technical assistance, as requested, to other NATO bodies and to member nations in connection with research and development problems in the aerospace field;
- Providing assistance to member nations for the purpose of increasing their scientific and technical potential;
- Recommending effective ways for the member nations to use their research and development capabilities for the common benefit of the NATO community.

The highest authority within AGARD is the National Delegates Board consisting of officially appointed senior representatives from each member nation. The mission of AGARD is carried out through the Panels which are composed of experts appointed by the National Delegates, the Consultant and Exchange Programme and the Aerospace Applications Studies Programme. The results of AGARD work are reported to the member nations and the NATO Authorities through the AGARD series of publications of which this is one.

Participation in AGARD activities is by invitation only and is normally limited to citizens of the NATO nations.

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PREFACE

AGARD accomplishes its mission through the programs of the Panels, the Consultant and Exchange Division and the Military Committee Studies Division. The Panel programs of AGARD are conducted at meetings which are organized as conferences, symposia, specialists meetings, or working group meetings, and planned at business meetings. The Consultant and Exchange Division organizes Lecture Series and Short Courses as well as provides individual consultants to the nations and AGARD Panels. The Military Committee Studies Division organizes and participates in Technology Studies conducted by the Panels and special Aerospace Applications Studies; both types of studies are requested by or through the North Atlantic Military Committee.

At the present time the undertaking of new Aerospace Applications Studies has been postponed in view of the extensive involvement of the Military Committee Studies Division in an assessment of potential technological advances in aerospace up to the end of the century, and their possible impact on military systems. This study, known as Project 2000, was initiated by AGARD in 1976 at the request of the North Atlantic Military Committee and is expected to be completed at the end of this year.

This AGARD Bulletin contains information on all the planned 1979 AGARD meetings including dates, locations and brief descriptions of their themes. Additional specific information will be provided by means of individual Meeting Announcements which will be distributed by the various Panels. Queries about participation in AGARD meetings can be addressed to the appropriate Panel Members or National Delegates whose names and addresses are listed in Section III of this Bulletin.

Included in this Bulletin is also a list of all AGARD publications which were released in 1978, together with their abstracts. Complete listings of all AGARD Publications which appeared since the founding of this agency are included in the "AGARD Index of Publications 1952–1970", the "AGARD Index of Publications 1971–1973" and the "AGARD Index of Publication 1974–1976" which are updated by Annual Supplements. Information on how AGARD documents may be obtained is given on the back cover of this Bulletin.

Robert H. Korkegi

Robert H.Korkegi
Director

SECTION I

1979 AGARD TECHNICAL MEETINGS

- CALENDAR OF AGARD MEETINGS 1979
- SUMMARY OF 1979 MEETING THEMES

Attendance at AGARD Panel Meetings and Lecture Series is by invitation only and is normally limited to citizens of the NATO Nations. Applications should be made to an AGARD National Delegate or Panel Member from the applicant's own country. Citizens of the Federal Republic of Germany or of the United States of America must apply respectively through the appropriate German or US Panel Coordinator. Citizens of the Italian Republic and The Netherlands must apply through the Italian National Delegate's Office and The Netherlands National Coordinator, respectively. The names and addresses of National Delegates, National Coordinators, and Panel Members will be found in Section III of this Bulletin.

CALENDAR OF PLANNED MEETINGS
1979

Tentative Dates	*Location*	*Activity*	*Type of Meeting/Subject*
22–26 January	BELGIUM (Brussels)	Aerospace Medical	Specialists' Meeting on – **Maintenance of Air Operations while under Attack with Chemical Agents** (Classified) – **Recent Advances in Aeronautical and Space Medicine**
5–6 March	TURKEY (Ankara)	Fluid Dynamics	Lecture Series No.98 **Missile Aerodynamics**
8–9 March	ITALY (Rome)	Fluid Dynamics	Lecture Series No.98 **Missile Aerodynamics**
12–16 March	BELGIUM (VKI, Brussels)	Fluid Dynamics	Lecture Series No.98 **Missile Aerodynamics**
21–23 March	FRANCE (Paris)	Headquarters	*46th* **National Delegates Board Meeting** 26th **Panel Chairmen Meeting** 9th **National Coordinators Meeting** 26th **Steering Committee Meeting**
1–6 April	UNITED STATES (Williamsburg, Va)	Structures & Materials	48th Panel Meeting/Specialists' Meeting – **Damping Effects in Aerospace Structures** – **Low-cost Aircraft Flutter Clearance**
2–6 April	NORWAY (Oslo)	Propulsion & Energetics	53rd Panel Meeting/Symposium on **Solid Rocket Motor Technology**
2–3 April	NORWAY (Oslo)	Structures & Materials	Lecture Series No.102 **Bonded Joints and Preparation for Bonding**
5–6 April	NETHERLANDS (The Hague)	Structures & Materials	Lecture Series No.102 **Bonded Joints and Preparation for Bonding**
9–13 April	TURKEY (Ankara)	Avionics	37th Panel Meeting/Symposium on **Avionics Reliability, its Techniques and Related Disciplines**
23–24 April	UNITED KINGDOM (London)	Propulsion & Energetics	Lecture Series No.103 **Non-Destructive Inspection Methods for Propulsion Systems and Components**
26–27 April	ITALY (Milan)	Propulsion & Energetics	Lecture Series No.103 **Non-Destructive Inspection Methods for Propulsion Systems and Components**
7–8 May	GERMANY (Bonn)	Avionics	Lecture Series No.100 **Methodology for Control of Life Cycle Costs for Avionics Systems**
10–11 May	GREECE (Athens)	Avionics	Lecture Series No.100 **Methodology for Control of Life Cycle Costs for Avionics Systems**
7–11 May	CANADA (Ottawa)	Guidance & Control	28th Panel Meeting/Symposium on **Advances in Guidance and Control Systems using Digital Techniques** (Classified)
14–18 May	ITALY (Naples)	Fluid Dynamics	44th Panel Meeting/Symposium on **Aerodynamic Characteristics of Controls**
14–15 May	UNITED STATES (Washington)	Aerospace Applications Studies Committee	16th Meeting (Classified)
16–18 May	UNITED STATES (Washington)	Military Committee Studies	P2000 Review Board Meeting (Classified)
21–25 May	UNITED KINGDOM (London)	Flight Mechanics	54th Panel Meeting/Symposium on **Missile System Flight Mechanics** (Classified)
28 May – 1 June	PORTUGAL (Lisbon)	Electromagnetic Wave Propagation	Symposium on **Special Topics in H.F. Propagation**
4–5 June	ITALY (Rome)	Guidance and Control	Lecture Series No.101 **Guidance and Control for Tactical Guided Weapons with Emphasis on Simulation and Testing**
7–8 June	TURKEY (Ankara)	Guidance and Control	Lecture Series No.101 **Guidance and Control for Tactical Guided Weapons with Emphasis on Simulation and Testing**

Tentative Dates	*Location*	*Activity*	*Type of Meeting/Subject*
11–12 June	UNITED STATES (Eglin AFB, Fa)	Guidance and Control	Lecture Series No.101 **Guidance and Control for Tactical Guided Weapons with Emphasis on Simulation and Testing**
4–5 June	UNITED KINGDOM (London)	Electromagnetic Wave Propagation	Lecture Series No.99 **Aerospace Propagation Media Modelling and Prediction Schemes for Modern Communications Navigation and Surveillance Systems**
14–15 June	UNITED STATES (Boulder, Co)	Electromagnetic Wave Propagation	Lecture Series No.99 **Aerospace Propagation Media Modelling and Prediction Schemes for Modern Communications Navigation and Surveillance Systems**
3–7 September	GERMANY (Munich)	Flight Mechanics	55th Panel Meeting/Symposium on the **Use of Computers as a Design Tool**
10–14 September	NORWAY (Spåtind)	Electromagnetic Wave Propagation	26th Panel Meeting/Specialists' Meeting on **Terrain Profiles and Contours in E.M. Propagation**
19–21 September	ITALY (Florence)	Headquarters	15th **Annual Meeting** 47th **National Delegates Board Meeting** 27th **Panel Chairmen Meeting**
24–28 September	NETHERLANDS (The Hague)	Fluid Dynamics	45th Panel Meeting/Symposium on **Turbulent Boundary-Layers – Experiments, Theory and Modelling**
1–5 October	GERMANY (Cologne)	Propulsion & Energetics	54th Panel Meeting/Specialists' Meeting on a) **Advanced Control Systems for Aircraft Power Plant** b) **Combustor Modelling**
8–12 October	GERMANY (Cologne)	Structures & Materials	49th Panel Meeting/Specialists' Meeting on **Ceramics for Turbine-engine Applications** (with participation of *PEP*)
1–2 October	UNITED KINGDOM (London)	Aerospace Medical	Lecture Series No.105 **Intensive Air Operations: Problems of Sleep, Wakefulness and Circadian Rhythms**
4–5 October	FRANCE (Paris)	Aerospace Medical	Lecture Series No.105 **Intensive Air Operations: Problems of Sleep, Wakefulness and Circadian Rhythms**
9–10 October	CANADA (Toronto)	Aerospace Medical	Lecture Series No.105 **Intensive Air Operations: Problems of Sleep, Wakefulness and Circadian Rhythms**
8–12 October	DENMARK (Copenhagen)	Guidance & Control	29th Panel Meeting/Symposium on **Air Traffic Management: Civil/Military Systems and Technologies** (Classified)
15–16 October	UNITED STATES (Dayton, Ohio)	Structures & Materials	Lecture Series No.102 **Bonded Joints and Preparation for Bonding**
15–19 October	FRANCE (Paris)	Avionics	38th Panel Meeting/Symposium on **Modelling and Simulation of Avionics Systems and Command, Control and Communications Systems**
16–18 October	GREECE (Athens)	Technical Information	32nd Panel Meeting/Specialists' Meeting on **International Access to Aerospace Information**
22–26 October	PORTUGAL (Lisbon)	Aerospace Medical	36th Panel Meeting/Specialists' Meeting on – **Aircrew Systems and Human Factors in Future High-Performance Aircraft** – **High-Speed/Low-Level Flight – Aircrew Factors** (with contributions by FMP and GCP)
29–30 October	NETHERLANDS (Delft)	Flight Mechanics	Lecture Series No.104 **Parameter Identification**
1–2 November	UNITED KINGDOM (London)	Flight Mechanics	Lecture Series No.104 **Parameter Identification**
19–21 November	GERMANY (Munich)	Military Committee Studies	P2000 Review Board Final Report Review (Classified)
22–23 November	GERMANY (Munich)	Aerospace Applications Studies Committee	17th Meeting (Classified)

Note: Meetings of the Military Committee Studies P2000 Working Groups are not included in this Calendar.

SUMMARY OF 1979 MEETING THEMES

AEROSPACE MEDICAL PANEL

Specialists' Meeting: **Maintenance of Air Operations while under Attack with Chemical Agents** (Classified). **Recent Advances in Aeronautical and Space Medicine**
22–26 January 1979, Brussels, Belgium

At this meeting, the first session (classified), entitled 'Maintenance of Air Operations while under Attack with Chemical Agents', will deal with the chemical warfare threat to air operations, the effects of chemical warfare agents, their detection and prophylaxis, the philosophy of protection against chemical warfare agents, the methods of providing this personal and collective protection and the physiological and operational penalties imposed by the chemical defence measures currently available and under development for aircrew. For the second session (unclassified), the topic 'Recent Advances in Aeronautical and Space Medicine' has been retained from the previous year's programme to present the significant medical advances regarding the problems of the selection of aircrew and astronauts, and supersonic and very long duration flight.

36th Panel Business Meeting/Specialists' Meeting: **Aircrew Systems and Human Factors in Future High-Performance Aircraft. High-Speed/Low-Level Flight – Aircrew Factors**
22–26 October 1979, Lisbon, Portugal

The Fall meeting will cover in its first session the subject of 'Aircrew Systems and Human Factors in Future High-Performance Aircraft', dealing with the operational characteristics of high-performance aircraft with emphasis on the physiological and psychological effects imposed on the aircrew. For the second session, the subject has been chosen to review, modify, and improve current operating systems, define operational needs and resulting operational conditions, pathophysilogical and performance limits, discuss methods to enhance performance, and improve survival.

A Lecture Series will be sponsored by the Panel on the subject of 'Intensive Air Operations: Problems of Sleep, Wakefulness and Circadian Rhythms' (see under the later heading of Lecture Series for further details).

AVIONICS PANEL

37th Panel Meeting/Symposium: **Avionics Reliability, its Techniques and Related Disciplines**
9–13 April 1979, Ankara Turkey

The Spring Symposium is entitled 'Avionics Reliability, its Techniques and Related Disciplines'. It will seek management and engineering approaches to definition (specification) of meaningful reliability requirements and the methods of achieving them.

38th Panel Meeting: **Modelling and Simulation of Avionics and Command Control and Communications Systems.**
15–19 October 1979, Paris, France

The Fall Symposium will examine 'Modelling and Simulation of Avionics and Command, Control, and Communications Systems'. With advances in computers and component technology, simulation is being used increasingly in avionics systems. This Symposium will cover the methodology and economics of simulation, simulation languages, computer techniques, and simulation applications, to provide an understanding of each aspect of simulation to optimize its use in the context desired.

ELECTROMAGNETIC WAVE PROPAGATION PANEL

Symposium: **Special Topics in HF Propagation**
28 May – 1 June 1979, Lisbon, Portugal

The purpose of this Symposium will be to examine in depth the current knowledge of HF propagation in all its current and contemplated uses, and permit exchange of information concerning requirements, capabilities and future research effort.

26th Panel Meeting/Specialists' Meeting: **Terrain Profiles and Contours in EM Propagation**
10–14 September, Spåtind, Norway

This Specialists' Meeting will address propagation problems associated with profiles and contours of the terrain. Theoretical aspects of digital terrain mapping, criteria of terrain shielding, terrain effects on antenna characteristics, and subsurface contours and profiles will be examined.

FLUID DYNAMICS PANEL

44th Panel Meeting/Symposium: **Aerodynamic Characteristics of Controls**
14–18 May 1979, Naples, Italy

This Symposium will focus on improving our understanding of the factors that determine aerodynamic effectiveness of controls. The flight envelopes of aircraft are being continuously expanded and increasing use is being made of electronic technology to assist the pilot and indeed take over this traditional role. Much effort is now being applied to the development of active control technology involving the use of controls in closed-loop stabilising systems with consequent design, handling and performance improvements, and thought is being given to controls suitable for direct lift (including side-force) control.

The increasing demands made of controls call for more accurate methods of predicting control characteristics, including interference effects, and exploration of novel methods of control. These include not only the traditional aerodynamic control surfaces, but also spoilers, tailerons, wingerons, flaperons, elevons, canards, blown controls, leading edge controls, vectored thrust controls, etc.

The Symposium will aim to reveal the more important problems with which we are faced and to determine the lines along which research should prove most fruitful. Experimental data covering all flight conditions including transonic speeds and high angles of attack will be included. Also invited will be studies of dynamic characteristics in manoeuvres, quick acting controls, effects of interference gaps and buffeting, experiences gained in active control in direct lift systems, prediction methods, and related problems of controls for missiles.

45th Panel Meeting/Symposium: **Turbulent Boundary-Layers – Experiments, Theory and Modelling**
24–28 September 1979, The Hague, The Netherlands

Turbulence is the principal unknown in any rational design of aircraft. In spite of very significant advances in computing techniques, the modelling of turbulent shear flows still rests on quite insecure foundations. A better understanding of turbulent boundary layers is crucial for further advances in aircraft performance prediction. The flux of mass momentum, and energy in laminar flow are proportional to the local gradients of concentration, velocity, and temperature. There exists no similar simple rule relating flux terms in turbulent flow to the corresponding gradients. In recent years, theory and modelling on one side and experiments on the other have followed diverging directions in turbulent research. Recent experiments have demonstrated the persistence of coherent structures in turbulent shear flows and consequently have cast doubt on the usual local transport relations and even on the usefulness of Reynolds averaging, used in practically all modelling approaches.

It is the purpose of the symposium to take stock of the present situation in turbulence research and to attempt, by bringing together experimentalists and theoreticians, to map out new directions in modelling and experimentation. In order to concentrate on one of the most important applied problems, the symposium deals specifically with turbulent boundary layers, in both incompressible and compressible fluid flow. Invited papers will include experimental studies aimed at a clarification of physical phenomena in turbulent boundary layers, such as the persistence and interaction of turbulent spots, the existence and effects of longitudinal vortices near a solid boundary, and the mechanism of the bursting phenomenon. Also to be invited are reports of analytical and numerical work which

either attempts to incorporate the recent experimental findings into a turbulence model or addresses the proposition that the observed coherent structure need not be considered in models aimed at a prediction of averaged boundary-layer properties. Finally, although laminar-turbulent transition is outside the scope of the symposium, results on possible persistent after-effects of transition on the turbulent boundary layer will be solicited.

FLIGHT MECHANICS PANEL

54th Panel Meeting/Symposium: **Missile System Flight Mechanics**
21–25 May 1979, London, United Kingdom

Missiles, like manned aircraft, are required to achieve certain goals in performance and controlability, they also have to obey the same laws of dynamics and aerodynamics and, while speeds, rates, and dynamic characteristics may be very different, the flight mechanics of missiles and of manned aircraft are fundamentally the same. For many reasons, however, the application of the laws of flight mechanics to missile and manned aircraft design have been applied differently. There is, therefore, much to be gained from a cross-fertilisation of the expertise in the two technologies.

It is considered appropriate that the initial FMP activity in this field should be a restricted one, dealing with the flight mechanics aspects of air-launched missiles that rely, to some extent, on aerodynamic means of achieving the required control and performance capabilities. Emphasis will be given to short range tactical missiles and guided weapons of the air-to-air and air-surface types, with consideration of longer range air-surface missiles and of systems with a look-down shoot-down capability. The impact of requirements for launch compatibility with fixed and rotary wing aircraft will be examined. The Symposium will consist of five sessions, including a round-table discussion, and a workshop that will present the very latest results and findings. The first session will cover the complete missile, from an overview of evolution and design development, through current requirements, to a discussion of the implications on missile flight mechanics of recent developments in guidance and control systems technologies, that have been made possible by advances in solid state avionics and digital processors. The second session will deal with design/development, including such things as preliminary design techniques and methods for meeting manoeuvre requirements. Session three will cover simulation and flight testing including performance, manoeuvre and hit simulation, test instrumentation and techniques and range requirements. Operational aspects will be covered in session four, with emphasis on experience and its impact on future requirements; also the problems of the man in the control loop will be discussed. Finally, a round-table discussion will explore the benefits to be obtained from an interchange of manned aircraft and missile technologies and will assess the possibilities for improved cost effectiveness.

55th Panel Meeting/Symposium: **The Use of Computers as a Design Tool**
3–7 September 1979, Münich, Germany

The complexity of aircraft design procedures, the large financial investment and technical efforts involved, and the increasing importance of the basic initial options in any new aircraft programme require heavy reliance on computers to generate valid and competitive solutions. The rapid and great advances in computer hardware and software, and the more and more specialized nature of computation, have resulted in the generation of a new breed of computer system engineers. There has been a tendency for two diverging groups to emerge: one group highly specialized in computing and knowing little about design, the other very familiar with design, but with limited knowledge in computing. This undesirable situation could be avoided by improving the communication between the designer and the computer specialist. There is also a need to overcome the problems of communication between the designer and computer itself and to handle the difficulties arising from the need for perpetual updating of computer programmes.

With these points in mind it is intended that this Symposium will cover the topic under four session headings. The first of these will investigate the present and future potential of small and large computer systems including such items as data collection and optimization techniques and computerised drawing. The second session will be on the use of computers in aircraft specification; covering such areas as operational research and mission definition for military aircraft and market survey and fuel economy for commercial aircraft. The third session, on the computer as a preliminary design tool, will examine the impact of recent advances. These have not only led to the possibility of making more detailed studies, but also to a tendency for development of either a modular design process, with numerous iterations between various specialised teams, or an integrated process based on a large interdisciplinary programme; the advantages and disadvantages of these will be discussed. The final session will look at the use of computers in detailed design and development. The areas covered will be aerodynamic programmes, including such items as wing design and airframe/propulsion integration; structural analysis, including aeroelasticity/handling qualities interaction and flutter; and more general items such as flight testing and system integration and

development. Throughout all the sessions emphasis will be placed on the financial implications of using the systems described and, in particular, their limitations.

GUIDANCE AND CONTROL PANEL

28th Panel Meeting/Symposium: **Advances in Guidance and Control Systems using Digital Techniques** (Classified)
7–11 May 1979, Ottawa, Canada

The Spring Symposium (NATO-CONFIDENTIAL) will deal with applications of microprocessors to guidance and control, application of advanced analytic and design methods, software design, simulation and validation techniques, multi-sensor landing for increased performance and fault tolerance, redundancy management and operational and development performance with these advances.

29th Panel Meeting/Symposium: **Air Traffic Management: Civil/Military Systems and Technologies** (Classified)
8–12 October 1979, Copenhagen, Denmark

The Fall Symposium will focus on applications to tactical situations in the NATO environment, thus requiring classified sessions (NATO-SECRET). Based on the presentation of possible operational scenarios, the conference will discuss the adequacy of those air traffic control concepts in current use and critically review recent advances including: digital data links, computer architecture, global positioning, automatic distribution of information, displays, processors and integrated systems. The transition to a future civil/military system using the most advanced techniques will be considered, and evolutionary implementation schemes will be proposed.

PROPULSION AND ENERGETICS PANEL

53rd Panel Meeting/Symposium: **Solid Rocket Motor Technology**
2–6 April 1979, Oslo, Norway

The Symposium, on 'Solid Rocket Motor Technology', is aimed at furnishing a comprehensive survey of the technology available for solid propellant rocket motors and its further development capabilities. Both research and technology problems will be discussed. Separate sessions will be devoted to ignition and extinction problems, and internal ballistics, to the combustion of metals and particles (considering both the basic problem of single particles as well as the combustion of particle clouds), and to smokeless propellants. Particular attention will be given to combustion instability, its analysis, and relation with dynamic properties of propellants and comparison between theoretical predictions and observations. High frequency instabilities, velocity coupling, suppression devices and the dynamic performance of nozzles are important features and will be discussed. The Symposium will be concluded by sessions concerned with heat transfer in nozzles and nozzle liners including suitable insulation materials as well as with testing and instrumentation which both will be covered in the aspect of laboratory work, development, and flight.

54th Panel Meeting/Specialists' Meetings: **Advanced Control Systems for Aircraft Powerplants. Combustor Modelling**
1–5 October 1979, Cologne, Germany

The first Specialists' Meeting relates to the fact that in recent years considerable progress has been achieved in digital electronic techniques and their use in control systems. This Meeting will review the state-of-the-art and discuss the optimum control strategies for aero engines, the possibilities of integrated engine intake and flight control systems with respect to future military aircraft. The implementation of control by advanced hydro-mechanical, fluidic, or electronic systems will be included and redundancy strategies and system integrity analyzed and compared with recent experimental experience of advanced engine controls.

The second Specialists' Meeting will deal with 'Combustor Modelling'. This Meeting addresses research workers of aero-engine manufacturers and other related industries as well as of institutes. Its objectives are to help manufacturers in selecting and substantiating adequate theoretical models and, on the other hand, to provide university researchers with knowledge about realistic combustors and on the experimental conditions under which theoretical models should be validated. Discussions will be focussed on purely theoretical work and its comparison with

experimental data. One part of the meeting will deal with elementary phenomena like fuel injection and vaporisation, overall models of chemical kinetics, aerodynamics of primary and dilution zones, modelling of gas and metal radiation, and will include non-stationary phenomena, e.g., ignition and instabilities. In a second part, synthesis of elements and application of models to performance, operation and optimization of main combustors in turbine engines, after-burners, and industrial combustors will be discussed as well as the pollution prediction capabilities, e.g., the generation of carbon monoxide, nitrogen oxides, unburned hydrocarbons and smoke.

For the Specialists' Meeting on 'Ceramics for Turbine Engine Applications', which will be sponsored by the Structures and Materials Panel, PEP will take the responsibility for the session on 'Systems Design Analysis' and share sponsorship with SMP for the session 'Ceramic Component Design and Test Experience', as well as for the round-table discussion.

STRUCTURES AND MATERIALS PANEL

48th Panel Meeting/Specialists' Meetings: **Damping Effects in Aerospace Structures. Low-Cost Aircraft Flutter Clearance**
1–6 April 1979, Williamsburg, USA

The Spring Panel Meeting will include two Specialists' Meetings, as follows. The main Meeting will be on 'Damping Effects in Aerospace Structures' which will deal with the type of aerospace problem where damping is of crucial importance and for which no systematic treatment has yet been attempted from a practical point of view. The second will be a one-day Meeting on 'Low-Cost Aircraft Flutter Clearance' which will review low-cost flutter prediction procedures, especially with regard to light airplanes and gliders.

49th Panel Meeting/Specialists' Meeting: **Ceramics for Turbine Engine Applications**
8–12 October 1979, Cologne, Germany

It is becoming increasingly apparent that uncooled ceramic components may be one of the best ways of meeting anticipated system requirements for engines with higher thrust-to-weight and thrust-per-unit-volume ratios for missile and RPV applications. Many of the programmes currently under way are addressing and solving the design problems outlined in a previous AGARDograph and a number of important lessons has already been learned about the selection and processing of ceramic materials for these applications. Sharing this information now and updating earlier publications in this area should greatly accelerate the development of ceramic engine technology. The Propulsion and Energetics Panel is participating in the preparation of the programme for this Meeting.

TECHNICAL INFORMATION PANEL

32nd Panel Meeting/Specialists' Meeting: **International Access to Aerospace Information**
16–18 October 1979, Athens, Greece

One of the main elements of the work of the Technical Information Panel is to assist NATO's aerospace research and development activities by improving the effectiveness of scientific and technical information systems throughout the member nations. The choice of theme for the 1979 Specialists' Meeting stems from consideration of this aspect of TIP's work. The Meeting will provide a survey of the existing facilities for international access to aerospace information and the problems involved. Thus, examples of official aerospace information channels will be reviewed. Technical requirements and apparent barriers to international cooperation and data exchange will also be addressed. Furthermore, the Meeting will take notice of special problems associated with aerospace information, such as access restrictions to certain types of document and full-text information, and the utilization of numeric aerospace data. It is planned to terminate the meeting with a half-day Workshop Session to address problems raised by members of the host nation in relation to aerospace information in the conduct of Greek research and development work.

LECTURE SERIES

Lecture Series No.98: **Missile Aerodynamics** (with Fluid Dynamics Panel)
5–6 March 1979, Ankara, Turkey
8–9 March 1979, Rome, Italy
12–16 March 1979, Brussels, Belgium

The course will cover all the chief aspects of the aerodynamics of tactical missiles. It will be introduced with an extended overview of the more classical topics, such as flow over wings and bodies, wing-body and wing-tail interference and aerodynamics of complete configurations. This course will be a follow-on from the previous VKI Lecture Series organized in 1976, in that the following more specialized topics related to improved design of missiles will be treated in more detail:

– control of missiles, high angle-of-attack aerodynamics, base flow, and
– weapon-aircraft interaction (stores and stores separation).

At the von Kármán Institute presentation of the Lecture Series, VKI will sponsor an additional 2½ days of lectures to cover the areas of kinetic heating, internal flows in airbreathing engines and external aerodynamic aspects of intakes. The published Proceedings will contain an extensive documentation of the subject (additional to all the oral presentations) and as such will be a valuable reference document.

Lecture Series Director: Dr B.E.Richards, Von Kármán Institute, Brussels, Belgium.

Lecture Series No.99: **Aerospace Propagation Media Modelling and Prediction Schemes for Modern Communications, Navigation, and Surveillance Systems** (with Electromagnetic Wave Propagation Panel)
4–5 June 1979, London, UK
14–15 June 1979, Boulder, USA

This Lecture Series will review modelling and prediction topics which have been presented at a number of meetings of the AGARD Electromagnetic Wave propagation panel in the last few years. Modelling and prediction schemes of the aerospace radio and optical propagation environment based on media characterization have become essential to meet requirements of operational accuracies in communication, navigation, and surveillance in military and civilian systems.

The lectures will include the following topics:

General modelling and prediction schemes.
Aerospace (atmosphere ionosphere, and the space environment).
Short- and long-term prediction techniques and agreement with observation data.
Adaptability of prediction techniques to radio and optical communication, navigation and surveillance.
Systems operating in the aerospace environment.
Effects of geophysical disturbances on the state of the media and their predictability.

Lecture Series Director: Dr H.Soicher, US Army Communications Research and Development Command, DRDCO-COM-RF-5, Fort Monmouth, New Jersey, USA.

Lecture Series No.100: **Methodology for Control of Life-Cycle Costs for Avionics Systems** (with Avionics Panel)
7–8 May 1979, Bonn, Germany
10–11 May 1979, Athens, Greece

The continually increasing costs of avionics systems during acquisition and their lifetime operation is a matter of grave concern to the NATO family of nations. The NATO Governments need greater visibility and control over the life-cycle costs of all weapon and avionic systems.

Fortunately, there have been formulated disciplined methods of providing such visibility and control over life-cycle costs; that is, over the development, acquisition, training, operating and support and, finally, disposal costs.

This Lecture Series presents the basic principles of Avionics Systems Cost Analysis in a rapidly changing technology environment and gives proven methods of achieving significant cost savings.

The Lecture Series will cover the following subjects:

Life-cycle costing (LCC)
Cost estimating methods,
Procurement techniques,
Source selection methods.

Design to Cost (DTC)
DTC is a management concept with unit cost objectives.

Technology Environment
Technology changes affect the cost and effectiveness of avionics systems.

Costing of Software
Discussion of costs and methods for reducing them.

Modelling
Mission Completion Success Probability Model (MCSP) and Design System Performance Cost (DSPC) model and other models incorporating reliability factors would be discussed.

Applications
This final session deals with the applications of the principles of LCC and DTC and the cost savings achieved.

Lecture Series Director: Dr I.G.Gabelman, Technical Associates Rome (NY), USA.

Lecture Series No.101: **Guidance and Control for Tactical Guided Weapons with Emphasis on Simulation and Testing** (with Guidance and Control Panel)
4–5 June 1979, Rome, Italy
7–8 June 1979, Ankara, Turkey
11–12 June 1979, Eglin AFB, USA

With the advent of modern control theory, a strong research effort has to be undertaken to investigate its impact on tactical guided weapons. To effectively accomplish this objective, it will be extremely beneficial to summarize the state-of-the-art of guidance and control for tactical weapons.

The tentative outline is as follows:

Introduction
Weapon delivery (target, acquisition and weapon delivery aspects).
Missile dynamics and control techniques (modern control application, higher order guidance, bank-to-turn control).
Missile guidance techniques (midcourse and terminal, guidance sensors, processing).
Guided weapon simulation techniques (digital, hardware-in-the-loop: development, validation).
Testing of missile guidance and control systems (new range techniques, interface with simulation).
Summary – Future trends.

Lecture Series Director: Mr C.T.Maney, Director, Plans and Research, USAF Armament Laboratory, Eglin Air Force Base, Florida 32542, USA.

Lecture Series No.102: **Bonded Joints and Preparation for Bonding** (with Structures and Materials Panel)
2–3 April 1979, Oslo, Norway
5–6 April 1979, The Hague, The Netherlands
15–16 October 1979, Dayton, USA

After more than 30 years of application in aircraft construction in roles with various degrees of structural importance, adhesive bonded joints are expected to see an increased use in more primary structural applications, both in conjunctions with metals as well as with advanced composites.

Basis for such advanced applications of bonded joints, however, must be ample knowledge of:

– structural design aspects,
– durability aspects

of bonded joints in order to provide the required static and dynamic strength of the bonded structure during its operational lifetime. With these demands in mind lectures are planned under the following headings:

Operational experience with adhesive bonded joints in military and civil aircraft.
The adhesive bonded joints as a fastening element in structures.
Fracture mechanical aspects of adhesive bonded joints and structures.
Materials and processes for adhesive bonded joints with optimum durability.
Special quality assurance aspects of adhesive bonded processes.
Non-destructive end-product inspection methods.

Lecture Series Director: Mr R.J.Schliekelmann, Fokker – WFWBV, Technological Centre, Schiphol, The Netherlands.

Lecture Series No.103: **Non-Destructive Inspection Methods for Propulsion Systems and Components** (with Propulsion and Energetics Panel)
23–24 April 1979, London, United Kingdom
26–27 April 1979, Milan, Italy

The safety of use of mechanical systems is dependent on the identification of possible defects in their components. This applies particularly to turbine engines, certain elements of which – in particular, turbine and compressor discs and blades – are subjected to extremely severe stresses: creep, low cycle fatigue, thermal fatigue.

These possible defects must be detected when the various parts are at the manufacturing stage, on the one hand, and, on the other, during periodic inspections when the engine is in service.

It is therefore indispensable to have available non-destructive inspection methods which, while they are accurate and sensitive, can be used in workshops for the detection of defects or cracks, however small they may be.

A considerable amount of research work has been conducted in this field on the world scale and has led to the development of various methods: ultra-sonics, magnetic inspection, X-ray pictures. New procedures, which are complementary to these already conventional methods, are in the process of development or optimization: acoustical emission, laser holography, Eddy currents, etc...

The aim of this Lecture Series is to survey the means currently available, with particular emphasis on the intrinsic possibilities and present limits of use of the non-destructive inspection methods the most widely applied to turbine engines, and to define the state-of-the-art of the most advanced methods.

Lecture Series Director: Ingénieur en Chef G.Bessonnat, Direction des Recherches, Etudes et Techniques, Paris, France.

Lecture Series No.104: **Parameter Identification** (with Flight Mechanics Panel)
29–30 October 1979, Delft, The Netherlands
1–2 November 1979, London, United Kingdom

The technique of Parameter Identification has been under development in a number of countries in recent years and, specifically, its application to the problems of analysis of flight test data has been examined by all the major NATO nations. As the last AGARD/FMP meeting on this subject was held in 1974, it was considered appropriate to bring together a number of experts in this field with a view to updating the information available and, in doing so, present it in the form of applications data and user experience so that it would be of practical value to the flight test engineer.

The lectures would examine basic theory and a number of applications of that theory to various areas of flight test work. The subjects covered include such topics as coefficient estimation including stability and control derivatives, performance and high angle-of-attack parameters, structural mode identification and turbulence, types of manoeuvre required; the purpose of parameters including vehicle compliance with specifications, definition of characteristics for simulation or refinement of configuration, and research to aid future design.

Lecture Series Director: Dr-Ing. P.Hamel, DFVLR, Braunschweig, Germany.

Lecture Series No.105: **Intensive Air Operations – Problems of Sleep, Wakefulness and Circadian Rhythm** (with Aerospace Medical Panel)
1–2 October 1979, London, United Kingdom
4–5 October 1979, Paris, France
9–10 October 1979, Toronto, Canada

The Lecture Series is intended for those concerned with the management of civil, and particularly military, personnel who have to cope with irregular work and rest. It will provide an understanding of the physiological processes involved in the adaptation of man to disturbed sleep and wakefulness and consider approaches to the problem of management including the use of drugs.

The lectures will be given in three parts:

1. Sleep, Wakefulness and Circadian Rhythms. Physiological and Psychological.
2. Adaptation of Man to Disturbed Sleep and Circadian Rhythmicity.
3. Management of Irregular Rest and Activity.

In this first part, attention will be given to the physiological basis of sleep, wakefulness and circadian rhythms and the psychological correlates including performance relevant to personnel involved in skilled activity. The second part will review studies on the adaptation of man to unusual patterns of rest and activity with special reference to present day situations, and the third part will attempt to provide a basis for the management of disturbed rest and the rationality for the use of drugs.

The series is designed for a wide range of interests in both the civil and, particularly, the military context, and for the land, sea and air environments. A particular feature will be the opportunity for participants with special interest in the management of such problems to take part in discussions with the lecturers. It is intended that the participants will include managers and operation staff as well as medical officers.

Lecture Series Director: Wing Commander A.N.Nicholson, RAF Institute of Aviation Medicine, Farnborough, Hants GU14 6SZ, UK.

MILITARY COMMITTEE STUDIES

16th Meeting of the **Aerospace Applications Studies Committee** (Classified)
14–15 May, Washington, United States

The Committee will finalize the Terms of Reference for the topics selected by the National Delegates Board as ASS Nos. 12 and 13. They will also organize the Working Group No.12 which is going to start a new ASS in July 1979 if so decided by the National Delegates at their Spring Meeting.

4th Meeting of the **P-2000 Review Board** (Classified)
16–18 May, Washington, United States

The Review Board will receive the final briefings from the three Study Groups on their respective studies.

SG 1: Attack of Surface Targets
SG 2: Defence Against Missiles
SG 3: Detection, Location and Recognition of Ground Targets

and give ultimate guidance.

5th Meeting of the **P-2000 Review Board** (Classified)
19–21 November 1979, Munich, Germany

The Review Board will conduct the final review of the three Study Reports and the overall Executive Report from the Studies Coordinator.

This should be the last meeting of the Review Board.

17th Meeting of the **Aerospace Applications Studies Committee** (Classified)
22–23 November 1979, Munich, Germany

The Committee will conduct the initial review of Study No.12 if previously started, draft Terms of Reference of Study topics proposed by the Military Committee and organize Working Group for Study No.13.

SECTION II

1978 AGARD PUBLICATIONS

- 1978 AGARD PUBLICATIONS BY SERIES
- ABSTRACTS OF 1978 AGARD PUBLICATIONS BY PANEL OR ACTIVITY

ABBREVIATIONS

AMP	AEROSPACE MEDICAL PANEL
AVP	AVIONICS PANEL
EPP	ELECTROMAGNETIC WAVE PROPAGATION PANEL
FMP	FLIGHT MECHANICS PANEL
FDP	FLUID DYNAMICS PANEL
GCP	GUIDANCE AND CONTROL PANEL
PEP	PROPULSION AND ENERGETICS PANEL
SMP	STRUCTURES AND MATERIALS PANEL
TIP	TECHNICAL INFORMATION PANEL
MCS	MILITARY COMMITTEE STUDIES
LS	LECTURE SERIES

1978 AGARD PUBLICATIONS BY SERIES

ADVISORY REPORTS

Number	*Title/Author/Editor*	*Publication Date*	*Activity*
AR91 Volume II	TECHNIQUES FOR SUPPRESSION OF RADARS ASSOCIATED WITH SAMs – Aerospace Applications Study No.7 (Classified)	July	MCS
AR101 Volume II (Eng)	PROPULSION AND POWER SUPPLIES FOR UNMANNED VEHICLES – SMALL RPV's POWERED BY TURBOJET OR TURBOFAN (Classified)	May	PEP
AR101 Volume II (Fr)	PROPULSION ET FOURNITURE DE PUISSANCE POUR LES VEHICLES TELEPILOTES PROPULSES PAR TURBOREACTEUR OR TURBOSOUFFLANTE (Classifie)	May	PEP
AR101 Volume III	PROPULSION SYSTEMS FOR FALSE TARGETS (Classified)	June	PEP
AR102 Volume I	INTERCEPTION OF MACH 3 AIRCRAFT BY FIGHTERS (Classified)	June	MCS
AR102 Volume II	INTERCEPTION OF MACH 3 AIRCRAFT BY FIGHTERS (Classified)	June	MCS
AR108	TECHNICAL EVALUATION REPORT OF THE SPECIALISTS' MEETING on UNSTEADY AIRLOADS IN SEPARATED AND TRANSONIC FLOW W.J.Mykytow, B.Laschka and J.J.Olsen	April	SMP
AR111	THE AGARD PROPULSION AND ENERGETICS PANEL: 1952–1977 S.S.Penner	November	PEP
AR114	TECHNICAL EVALUATION REPORT ON THE FLIGHT MECHANICS PANEL SYMPOSIUM on ROTORCRAFT DESIGN H.R.Velkoff	January	FMP
AR115	TECHNICAL EVALUATION REPORT on the 24th GUIDANCE AND CONTROL PANEL TECHNICAL MEETING: SYMPOSIUM on APPLICATIONS OF ADVANCES IN NAVIGATION TO GUIDANCE AND CONTROL	June	GCP
AR116	TECHNICAL EVALUATION REPORT on the 50th MEETING OF THE PROPULSION AND ENERGETICS PANEL – A SYMPOSIUM on HIGH-TEMPERATURE PROBLEMS IN GAS TURBINE ENGINES R.Eggerbrecht and S.Lombardo	March	PEP
AR117	COMMUNICATIONS WITH LOW FLYING AIRCRAFT BEYOND THE HORIZON (Classified) B.Burgess	July	AVP/EPP
AR118	OPTIMISATION OF PILOT CAPABILITY AND AVIONIC SYSTEM DESIGN F.S.Stringer (Editor)	November	AVP
AR119	TECHNICAL EVALUATION REPORT on the MULTI-PANEL SYMPOSIUM on FIGHTER AIRCRAFT DESIGN H.Andrews and R.J.Balmer	February	FMP
AR122	TECHNICAL EVALUATION REPORT of the FLUID DYNAMICS PANEL SYMPOSIUM on LAMINAR-TURBULENT TRANSITION M.V.Morkovin	June	FDP
AR123	TECHNICAL EVALUATION REPORT on the 51st (B) SPECIALISTS' MEETING OF THE PROPULSION AND ENERGETICS PANEL on SEAL TECHNOLOGY IN GAS TURBINE ENGINES B.Wrigley	July	PEP

ADVISORY REPORTS
(Continued)

Number	*Title/Author/Editor*	*Publication Date*	*Activity*
AR124	TECHNICAL EVALUATION REPORT on the 51st (A) SPECIALISTS' MEETING OF THE PROPULSION AND ENERGETICS PANEL on ICING TESTING FOR AIRCRAFT ENGINES D.Tedstone	August	PEP
AR125	TECHNICAL EVALUATION REPORT on the FLUID DYNAMICS PANEL SYMPOSIUM on PREDICTION OF AERODYNAMIC LOADING Rimantas Liaugminas	September	FDP
AR126	TECHNICAL EVALUATION REPORT on the SPECIALISTS' MEETING OF THE FLIGHT MECHANICS PANEL on PILOTED AIRCRAFT ENVIRONMENT SIMULATION TECHNIQUES K.J.Staples	October	FMP
AR127	AIRCRAFT ICING	November	FDP
AR 128	TECHNICAL EVALUATION REPORT on the FLUID DYNAMICS PANEL SYMPOSIUM on UNSTEADY AERODYNAMICS H.Bergh	October	FDP

REPORTS

Number	*Title/Author/Editor*	*Publication Date*	*Activity*
R660	CERTIFICATION PROCEDURES FOR COMPOSITE STRUCTURES	January	SMP
R663	AN INTRODUCTION TO THE PROBLEM OF DYNAMIC STRUCTURAL DAMPING P.Santini, A.Castellani and A.Nappi	January	SMP
R664	APPLICATION OF STRUCTURAL OPTIMIZATION FOR STRENGTH AND AEROELASTIC DESIGN REQUIREMENTS W.Lansing, E.Lerner and R.F.Taylor	January	SMP
R665	EFFECTS OF STRUCTURAL NON-LINEARITIES ON AIRCRAFT VIBRATION AND FLUTTER E.Breitbach	January	SMP
R666	FIFTH ADVANCED OPERATIONAL AVIATION MEDICINE COURSE: ECOLE D'APPLICATION DU SERVICE DE SANTE POUR L'ARMEE DE L'AIR PARIS, FRANCE, 12–23 SEPTEMBRE 1977 G.F.Perdiel (Editor)	June	AMP
R667	COMBAT DAMAGE TOLERANCE AND REPAIR OF AIRCRAFT STRUCTURES	June	SMP
R668	CONSIDERATIONS ON WING STORES FLUTTER – Asymmetry – Flutter Suppression	July	SMP
R669	SUGGESTED DATA ELEMENTS FOR RECORDING ON-GOING RESEARCH AND DEVELOPMENT EFFORTS: A MANAGEMENT INFORMATION SYSTEM H.E.Sauter	October	TIP

AGARDOGRAPHS

Number	*Title/Author/Editor*	*Publication Date*	*Activity*
AG231	FATIGUE DESIGN OF FIGHTERS	January	SMP

AGARDOGRAPHS
(Continued)

Number	*Title/Author/Editor*	*Publication Date*	*Activity*
AG232	AN INTRODUCTION TO TURBULENCE IN GEO-PHYSICS, AND AIR-SEA INTERACTIONS M.F.Coantic	July	FDP
AG233	ASSESSING PILOT WORKLOAD	February	FMP
AG234	ACTIVE CONTROLS IN AIRCRAFT DESIGN P.R.Kurzhals	November	GCP
AG235 Volume I	MANUAL OF DOCUMENTATION PRACTICES APPLICABLE TO DEFENCE-AEROSPACE SCIENTIFIC AND TECHNICAL INFORMATION S.C.Schuler (General Editor)	August	TIP
AG236	INSTABILITY, TRANSITION TO TURBULENCE AND PREDICTABILITY M.V.Morkovin	July	FDP

CONFERENCE PROCEEDINGS

Number	*Title/Author/Editor*	*Publication Date*	*Activity*
CP216	METHODS TO ASSESS WORKLOAD	June	AMP
CP218	THE USE AND ABUSE OF SOCIAL DRUGS Col. H.C.Holloway, USA MC (Editor)	January	AMP
CP220	APPLICATIONS OF ADVANCES IN NAVIGATION TO GUIDANCE AND CONTROL	February	GCP
CP227	UNSTEADY AERODYNAMICS	February	FDP
CP229	HIGH-TEMPERATURE PROBLEMS IN GAS TURBINE ENGINES	February	PEP
CP230	IMPACT OF CHARGE-COUPLED DEVICES AND SURFACE ACOUSTIC WAVE DEVICES ON SIGNAL-PROCESSING AND IMAGERY IN ADVANCED SYSTEMS Y.Brault (Editor)	June	AVP
CP231	PROSPECTIVE MEDICINE OPPORTUNITIES IN AEROSPACE MEDICINE Dr J.Triebwasser	September	AMP
CP232	SPECIFIC FINDINGS IN CARDIOLOGY AND PULMONARY FUNCTION WITH SPECIAL EMPHASIS ON ASSESSMENT CRITERIA FOR FLYING Col. M.C.Lancaster (Editor)	September	AMP
CP233	ROTORCRAFT DESIGN	January	FMP
CP234	NON-DESTRUCTIVE INSPECTION RELATIONSHIPS TO AIRCRAFT DESIGN MATERIALS	March	SMP
CPP235	DYNAMIC STABILITY PARAMETERS (Preprints)	May	FDP
CP235	DYNAMIC STABILITY PARAMETERS	November	FDP
CPP236	ICING TESTING FOR AIRCRAFT ENGINES (Preprints)	March	PEP
CP236	ICING TESTING FOR AIRCRAFT ENGINES	August	PEP
CPP237	SEAL TECHNOLOGY IN GAS TURBINE ENGINES (Preprints)	March	PEP

CONFERENCE PROCEEDINGS
(Continued)

Number	*Title/Author/Editor*	*Publication Date*	*Activity*
CP237	SEAL TECHNOLOGY IN GAS TURBINE ENGINES	August	PEP
CPP238	OPERATIONAL MODELLING OF THE AEROSPACE PROPAGATION ENVIRONMENT (Preprints)	April	EPP
CP238	OPERATIONAL MODELLING OF THE AEROSPACE PROPAGATION ENVIRONMENT	November	EPP
CPP239	DIGITAL COMMUNICATIONS IN AVIONICS (Preprints)	May	AVP
CP240	GUIDANCE AND CONTROL DESIGN CONSIDERATIONS	April	GCP
CP240 (Suppl)	GUIDANCE AND CONTROL DESIGN CONSIDERATIONS (Classified)	June	GCP
CP241	FIGHTER AIRCRAFT DESIGN	June	FMP
CP241 (Suppl)	FIGHTER AIRCRAFT DESIGN (Classified)	July	FMP
CP242	PERFORMANCE PREDICTION METHODS	May	FMP
CP243	CHARACTERIZATION OF LOW CYCLE HIGH TEMPERATURE FATIGUE BY THE STRAINRANGE PARTITIONING METHOD	August	SMP
CP244	ASPECTS OF ELECTROMAGNETIC WAVE SCATTERING IN RADIO COMMUNICATIONS	September	EPP
CPP245	MILLIMETER AND SUBMILLIMETER WAVE PROPAGATION AND CIRCUITS (Preprints)	August	EPP
CPP246	INFORMATION AND INDUSTRY (Preprints)	October	TIP
CPP247	HIGH ANGLE-OF-ATTACK AERODYNAMICS (Preprints)	September	FDP
CPP248	STRESSES, VIBRATIONS, STRUCTURAL INTEGRATION AND ENGINE INTEGRITY (INCLUDING AEROELASTICITY AND FLUTTER) (Preprints)	October	PEP
CP249	PILOTED AIRCRAFT ENVIRONMENT SIMULATION TECHNIQUES	October	FMP
CPP251	TECHNIQUES FOR DATA HANDLING IN TACTICAL SYSTEMS – II (Preprints)	October	AVP
CPP252	STRATEGIES FOR AUTOMATIC TRACK INITIATION (Preprints)	October	AVP
CPP253	MODELS AND ANALOGUES FOR THE EVALUATION OF HUMAN BIODYNAMIC RESPONSE, PERFORMANCE AND PROTECTION (Preprints)	November	AMP
CPP254	HUMAN FACTORS ASPECTS OF AIRCRAFT ACCIDENTS AND INCIDENTS (Preprints)	November	AMP
CP255	OPERATIONAL HELICOPTER AVIATION MEDICINE	December	AMP

CONFERENCE PROCEEDINGS
(Continued)

Number	*Title/Author/Editor*	*Publication Date*	*Activity*
CP257	THE IMPACT OF INTEGRATED GUIDANCE AND CONTROL TECHNOLOGY AND WEAPONS SYSTEMS	December	GCP
CP257 (Suppl)	THE IMPACT OF INTEGRATED GUIDANCE AND CONTROL TECHNOLOGY AND WEAPONS SYSTEMS (Classified)	December	GCP

LECTURE SERIES

Number	*Title/Author/Editor*	*Publication Date*	*Activity*
LS92	THE APPLICATION OF INEXPENSIVE MINICOMPUTERS TO INFORMATION WORK	March	DPP
LS93	RECENT ADVANCES IN RADIO AND OPTICAL PROPAGATION FOR MODERN COMMUNICATIONS, NAVIGATION AND DETECTION SYSTEMS	April	DPP
LS94	THREE-DIMENSIONAL AND UNSTEADY SEPARATION AT HIGH REYNOLDS NUMBERS	February	DPP
LS95	STRAP-DOWN INERTIAL SYSTEMS	May	DPP
LS96	AIRCRAFT ENGINE FUTURE FUELS AND ENERGY CONSERVATION	September	DPP
LSP97	FRACTURE MECHANICS DESIGN METHODOLOGY (Preprints)	September	DPP

MISCELLANEOUS

Number	*Title/Author/Editor*	*Publication Date*	*Activity*
AGARD BULLETIN 1978/1: MEETINGS, PUBLICATIONS, MEMBERSHIP		January	HQ
DIRECTOR'S ANNUAL REPORT TO THE NORTH ATLANTIC MILITARY COMMITTEE 1977		March	HQ
AGARD HIGHLIGHTS 1978/1		March	HQ
AGARD CALENDAR OF SELECTED AERONAUTICAL AND SPACE MEETING (MAY–DEC 1978)		April	HQ
AGARD BULLETIN 1978/2		August	HQ
AGARD HIGHLIGHTS 1978/2		September	HQ
AGARD TERMS OF REFERENCE/78		September	HQ
Manuel 10	MANUEL SUR LA FATIGUE DES STRUCTURES W.G.Barrois	December	SMP

ABSTRACTS OF 1978 AGARD PUBLICATIONS BY PANEL OR ACTIVITY

AEROSPACE MEDICAL PANEL (AMP)

Conference Proceedings 218
H.C.Holloway (Editor)
January 1978
56 pages
ISBN 92-835-1266-9

The Use and Abuse of Social Drugs

The four papers of this short session deal with both the moderate and untoward use of alcohol, marijuana and tobacco (called "social drugs" since they favour social ties within a community), as far as social and performance consequences are concerned.

Some of the effects brought about by these agents on military organizations and aircrews are highlighted, as well as the impact on the approach to problems related to their detection, significance and treatment, resulting from recent investigations.

Further work still appears to be needed to provide subtle tools and methods for the evaluation of their role within the military.

Report 666
G.F.Perdriel (Editor)
June 1978
88 pages
ISBN 92-835-1287-1

Fifth Advanced Operational Aviation Medicine Course: Ecole d'Applicaction du Service de Santé pour l'Armée de l'Air Paris, France, 12–23 September 1977

This Report contains all the lectures delivered to the Course, which dealt with the selection procedures and performance standards applied to flying personnel in respect of ophthalmology and oto-rhino-laryngology.

Visual, auditory, and vestibular fitness standards have to be sufficiently well specified to ensure that flying personnel, in the course of their duties, are able to perform functions which, in many cases, are becoming increasingly complex and difficult.

Medical examinations of flying personnel undertaken at examination centres must use precise and reliable techniques to assess flight fitness.

Conference Proceedings 216
June 1978
142 pages
ISBN 92-835-1285-5

Methods to Assess Workload

For the measurement of workload a wide variety of methods is employed, frequently in an interdisciplinary setting.

This multifaceted approach to the problems of the methods best suited to assess workload is highlighted by the range of topics covered in the meeting.

Methodology questions involve basic issues like measurement sensitivity, reliability and validity; instrumentation and associated techniques; study environment ranging from the laboratory to simulator and in-flight studies.

Conference Proceedings 231
J.Triebwasser (Editor)
September 1978
106 pages
ISBN 92-835-1293-6

Prospective Medicine Opportunities in Aerospace Medicine

Propspective medicine seeks to identify the propensity for disease development at a stage long before clinical pathology can be detected and thus enables the delivery of medical care well beyond the current concepts of preventive medicine.

Specific identification of risk factors stimulates the modification of risk through specific education and clinical efforts.

The prospective medicine approach could form the basis for significant revision of selection and retention criteria for the military aircrew.

Conference Proceedings 232
M.C.Lancaster (Editor)
September 1978
176 pages
ISBN 92-835-0221-3

Specific Findings in Cardiology and Pulmonary Function with Special Emphasis on Assessment Criteria for Flying

Cardiopulmonary diseases constitute the most significant health problem in the military forces of the NATO countries in terms of death and premature disability.

The papers presented at the Aerospace Medical Panel Specialists' Meeting held in London, UK, 24–28 October 1977, provide valuable data on normal values, natural history, performance of testing methods, assessment of newer techniques for disease detection and definition as well as philosphies of determination of fitness to fly.

Conference Preprint 253
November 1978
240 pages

Models and Analogues for the Evaluation of Human Biodynamic Response, Performance, and Protection

Preprints of papers delivered at Specialists' Meeting, Paris, November 1978.

Conference Preprint 254
November 1978
76 pages

Human Factors Aspects of Aircraft Accidents and Incidents

Preprints of papers delivered at Specialists' Meeting, Paris, November 1978.

Conference Proceedings 255
S.C.Knapp (Editor)
December 1978
656 pages
ISBN 92-835-0226-4

Operational Helicopter Aviation Medicine
Helicopters have become increasingly complex. Their operational missions can be extremely demanding for aircrews and significantly differ from those of fixed wing aircraft.

Rotary wing operations are compounded by specific stresses and environments, special safety and workload aspects, unique performance and goals.

Combat flexibility and air mobility in land and sea warfare, medical evacuation, search and rescue, fatigue related accidents, human factors of helicopter design, visual and acoustic aspects of helicopter operations, and crashworthiness of fuel systems and aircraft, are some of the elements of the scenarios staged by the authors.

AVIONICS PANEL (AVP)

Conference Preprint 239
May 1978
328 pages

Digital Communication in Avionics
Preprints of papers presented at Panel Symposium, Munich, June 1978.

Conference Proceedings 230
Y.Brault (Editor)
June 1978
502 pages
ISBN 92-835-0216-7

Impact of Charge Coupled Devices and Surface Acoustic Wave Devices on Signal Processing and Imagery in Advanced Systems
New concepts in imagery and signal processing techniques have been fostered by the technological advances in charge coupled devices and surface acoustic waves. These two technologies have not, in general, been treated in a common seminar.

This Symposium was an attempt to promote in each community an awareness of the concepts and techniques which could lead to a synthesis of the two in advanced digital systems.

Advisory Report 117
(Classified)
B.Burgess (Editor)
July 1978
34 pages

Communications with Low Flying Aircraft Beyond the Horizon
A study has been made and techniques identified which would give some capability of communications between a ground station and an aircraft flying at low altitudes beyond line-of-sight. These are (1) classical HF sky-wave communications, (2) use of satellite communications operating at UHF, (3) use of manned aircraft (NAEW) as a relay aircraft, (4) using RPVs as relays, (5) meteor burst communications.

Recommendations that the nations should continue study and support work in these areas are made.

Conference Preprint 251
October 1978
228 pages

Techniques for Data Handling in Tactical Systems
Preprints of papers presented at Panel Symposium, Monterey, October 1978.

Conference Preprint 252
October 1978
188 pages

Strategies for Automatic Track Initiation
Preprints of papers presented at Specialists' Meeting, Monterey, October 1978.

Advisory Report 118
F.S.Stringer (Editor)
November 1978
104 pages
ISBN 92-835-1292-8

Optimisation of Pilot Capability and Avionic System Design
Recent advances in avionic systems technology offer facilities to combat aircraft designers to transform completely the potential of engines and airframes into more powerful total weapons systems. To date there has been no serious attempt to equate the problems created by increasing complexity and cost of systems with the costs and benefits offered by aircrew. The ability of aircrew to achieve benefit from systems without an unacceptable attendant level of cockpit workload, requires study.

The contributions by authors with backgrounds related to diverse disciplines, sets the scene and offers some guidelines for future research. The book is an introduction to the subject to all who are concerned with the design, procurement or operation of military aircraft.

ELECTROMAGNETIC WAVE PROPAGATION PANEL (EPP)

Conference Preprint 238
April 1978
294 pages

Operational Modelling of the Aerospace Propagation Environment
See Conference Proceedings 238 below.

Advisory Report 117
(Classified)
B.Burgess (Editor)
July 1978
34 pages

Communications with Low Flying Aircraft Beyond the Horizon
A study has been made and techniques identified which would give some capability of communications between a ground station and an aircraft flying at low altitudes beyond line-of-sight. These are (1) classical HF sky-wave communications, (2) use of satellite communications operating at UHF, (3) use of manned aircraft (NAEW) as a relay aircraft, (4) using the RPVs as relays, (5) meteor burst communications.

Recommendations that the nations should continue study and support work in these areas are made.

Conference Preprint 245
August 1978
256 pages

Millimeter and Submillimeter Wave Propagation and Circuits
Preprints of papers presented at Panel Meeting, Munich, September 1978.

Conference Proceedings 244
A.N.Ince (Editor)
September 1978
550 pages
ISBN 92-835-0219-1

Aspects of Electromagnetic Wave Scattering in Radio Communications
The Proceedings deal with the theory of scattering and reflection in the troposphere, the ionosphere, from meteor trails, and also scattering from ground environmental hazards such as hills, trees and buildings. Included in the propagation aspect are the prediction of long and short term signal characteristics and the modelling and simulation of radio channels using scatter mode of propagation. The proceedings also cover transmission and signal processing techniques for effective communications over such channels.

Conference Proceedings 238
Volumes 1 and 2
H.Soicher (Editor)
November 1978
732 pages
ISBN 92-835-0224-8

Operational Modelling of the Aerospace Propagation Environment
High-performance military and civilian systems operating in the aerospace environment require propagation media characterization to meet reliability and accuracy goals. The atmosphere, ionosphere, and the space environment constitute the media within which waves propagate. The users of communication, navigation and surveillance systems must have continuous background information regarding the state of these media as well as their variability and their response to natural disturbances.

Ideally, such information is available through sophisticated forecasting techniques based on media models and supported by periodic (or real-time) updating of data at specified locations. Modelling, and consequently forecasting, can and must be improved significantly through a better understanding of the governing processes of all the interrelated parts of the space environment.

FLIGHT MECHANICS PANEL (FMP)

Advisory Report 114
H.R.Velkoff
January 1978
14 pages
ISBN 92-835-1273-1

Technical Evaluation Report on the Flight Mechanics Panel Symposium on Rotorcraft Design
This report presents a review and evaluation of the Flight Mechanics Panel Symposium on Rotorcraft Design. It is apparent that the levels of technology of both military and civil helicopters now entering service are very high. It is also evident that the highly specialized requirments of the military aircraft have caused the military helicopters to be less useful for direct application to civil markets. Of prime concern is the inability to produce derivatives of the large military transports for use as commercial airline helicopters. It was clear that the reason for this was the complex, costly civil certification required combined with a limited market as seen by the manufacturers.

Technical Evaluation of the AGARD Flight Mechanics Panel Symposium held at Moffett Field, California, USA 16–19 May, 1977. The proceedings are published as AGARD Conference Proceedings No.233.

Conference Proceedings 233
January 1978
352 pages
ISBN 92-835-1272-3

Rotorcraft Design
These proceedings consist of the 26 papers that were presented at a Flight Mechanics Panel Symposium on Rotorcraft Design. The basic theme of this meeting was the examination of the opportunities for coordinating military and civil requirements and specifications. There were five sessions during which the following fields were covered: military requirements and new rotorcraft systems, civil operations and new designs, research vehicles, rotor wind tunnel and flight research, common ground for civil military co-operation. The meeting was concluded with a Round Table in which the possibilities for future exchanges of information, between military and civilian rotorcraft designers and operators, were examined. The many conclusions and recommendations arising from this symposium are discussed fully in a Technical Evaluation Report, AGARD Advisory Report Number 114.

Advisory Report 119
H.Andrews and R.J.Balmer
February 1978
12 pages
ISBN 92-835-1275-8

Technical Evaluation Report on the Multi-Panel Symposium on Fighter Aircraft Design

This report evaluates the AGARD Multi-Panel Symposium on Fighter Aircraft Design held from 3–6 October 1977. The primary conclusions of the report are that technology is available, in all areas of fighter design, to meet the military requirements for the 80's. However, the cost of using the most advanced technology to meet every conceivable requirement can be exorbitant. Cost-effectiveness is of vital importance. Future operational requirements must be carefully developed and clearly defined so as to ensure the most economical solution. Future fighter aircraft must be designed with sufficient flexibility to meet the changing needs during their service life. Research and development should be directed towards those areas offering the most cost-effective solutions.

Recommendations are made to the NATO Military Committee and for future studies by AGARD.

AGARDograph 233
February 1978
84 pages
ISBN 92-835-74-X

Assessing Pilot Workload

The assessment of levels of pilot workload associated with the various phases and subphases of flight is important in the design, development, and evaluation of aircraft handling qualities and of display and guidance systems. This AGARDograph, written primarily for flight test engineers and pilots, is intended as a guide to the different methods available for estimating workload and in particular to those techniques suitable for use in aircraft. An introductory chapter briefly reviews the various concepts and classifications of workload; the former tend to fall into two main areas, those related to workload as task-demands and those to workload as pilot-effort. In Chapter 2, subjective assessment, at present the most used method, is discussed from the viewpoint of the test pilot. Physiological methods in general are reviewed in Chapter 3 with those techniques availabel for use in flight being discussed in more detail. Chapter 4 describes various objective methods and presents examples of their practical application. Whereas the methods in Chapters 2 and 3 are appropriate only to workload as effort, objective methods contain techniques appropriate to workload as task-demands as well as to effort. The former techniques are particularly valuable for providing data which can be used to construct models and to predict levels of workload. Different modelling techniques will be discussed in a proposed supplement entitled Engineering Methods.

Conference Proceedings 242
May 1978
364 pages
ISBN 92-835-1282-0

Performance Prediction Methods

These proceedings consist of the papers presented at the FMP Specialists Meeting on Performance Prediction Methods. They cover general concepts of performance prediction, including special problems; prediction of complete aeroplane performance, and the comparison of some specific predictions with flight test results. Although no full analytic performance prediction method was presented, those described relying heavily upon wind-tunnel data, the papers give a good insight into the art and many are worth study.

There were also papers on flight path optimization, engine performance prediction and the input of the pilot.

Conference Proceedings 241
June 1978
298 pages
ISBN 92-835-0215-9

Fighter Aircraft Design

These proceedings consist of the unclassified papers that were presented at the AGARD Multi-Panel Symposium on Fighter Aircraft Design. The classified papers are published as a supplement to this document. The basic theme of the symposium was to review what had been learned from the current fighter aircraft and to explore what technology promised for the future, in relation to the likely requirements. The design of future fighters was discussed in these contexts, emphasizing the defeat of the anticipated threats with minimum life cycle cost. All the major aspects of fighter design were covered with sessions on systems design, aerodynamics and configurations, propulsion, structures and materials, avionics and guidance, and human factors. The recommendations arising from this symposium are discussed in a Technical Evaluation Report, AGARD Advisory Report Number 119.

Conference Proceedings 241
(Supplement)
(Classified)
July 1978
84 pages

Fighter Aircraft Design

This Supplement consists of the classified papers that were presented at the AGARD Multi-Panel Symposium on Fighter Aircraft Design. See Conference Proceedings 241.

Advisory Report 126
K.J.Staples
October 1978
18 pages
ISBN 92-835-1299-5

Technical Evaluation Report on the Specialists' Meeting of the Flight Mechanics Panel on Piloted Aircraft Enviornment Simulation Techniques

This report evaluates the AGARD FMP Specialists' Meeting on Piloted Aircraft Environment Simulation Techniques held in Brussels on 24–27 April 1978. Following an introduction outlining the role of piloted simulation, the report considers the papers presented during the meeting. This is followed by a report of the round-table discussion, including contributions from the floor. Finally, an overall evaluation of the meeting is made.

The general quality of the papers was high and broad coverage of the topic of the meeting was achieved. Detailed descriptions of techniques, as well as of actual hardware for satisfying various needs, were given. A few papers gave a critical appraisal of the deficiencies of simulators for particular purposes. Nevertheless, criteria for judging or specifying simulators were still lacking and great emphasis on the role of specific features of simulators in satisfying users' requirements is clearly needed. The scientific and mathematical description of atmospheric characteristics is now well advanced; the techniques of presentation to the pilot still need further refinement. A particular difficulty is the inability of current visual displays to adequately represent atmospheric phenomena via the visual channel. The role of the visual displays and motion platforms in providing cues to the pilot was a subject of considerable debate and was certainly not resolved at the meeting. It is an area requiring urgent study. Also the differing requirements of simulators in the training and research and development roles need to be delineated and defined; not least of the difficulties may be the identification of the training needs.

Conference Proceedings 249
October 1978
316 pages
ISBN 92-835-0222-1

Piloted Aircraft Environment Simulation Techniques

These proceedings consist of the papers presented at the FMP Specialists' Meeting on Piloted Aircraft Environment Simulation Techniques. An extensive coverage of the subject is presented. The areas examined range from requirements and user experience, through simulation of the atmosphere – including atmospheric models – to assessment of a wide range of visual systems. Also covered are motion systems, 'g' seats and air combat simulators. A comprehensive Technical Evaluation of the meeting appears in AGARD Advisory Report No.126.

FLUID DYNAMICS PANEL (FDP)

Conference Proceedings 227
February 1978
624 pages
ISBN 92-835-0212-4

Unsteady Aerodynamics

The Symposium identified the need for carefully conceived experimental unsteady flow data, particularly for both unseparated and separated two- and three-dimensional turbulent boundary layers. Detailed, accurate measurements of critical flow parameters was encouraged. It was agreed that linearized theories of unsteady inviscid flows provided a useful basis for many engineering applications, particularly in the early design stages of aircraft, but for more reliable calculations in the transonic and supersonic regimes the emphasis should be on development of non-linear numerical methods. Transonic numerical codes are increasingly efficient but their validity and accuracy needs assessment. Future calculations should include boundary layer effects even if no shock-wave interaction is included. The importance of Reynolds number on the dynamic stall was indicated. It was advised that serious consideration should be given to the development of a manual of eaeroelasticity for turbo-machines. An important factor in determining the characteristics of a rotor blade is the interaction of the blade with vortices shed by other blades. Research is required on the nature of this interaction and its effect on the dynamic stall of the blade.

Conference Preprint 235
May 1978
260 pages

Dynamic Stability Parameters

See Conference Proceedings 235 below.

Advisory Report 122
M.V.Morkovin
June 1978
18 pages
ISBN 92-835-1283-9

Technical Evaluation Report of the Fluid Dynamics Panel Symposium on Laminar-Turbulent Transition

The Symposium permitted a review of progress attained during the last ten years in transitional flow research. The transitional phenomenon remains as one of the least understood fluid mechanic processes. Difficulties encountered are due to the multiplicity of poorly identified parameters which influence transition, including ill-founded, pseudotheoretical concepts and coarse experimental techniques and

procedures. The papers presented are critiqued herein stressing those contributions which enhance our understanding as well as those which fall short of expectation. Improvements have been realized in linear and non-linear stability theory and through increased proliferation of powerful numerical calculation methods. Experimentally, progress has been noted in analysis and interpretation of results, including signal processing methods. Considerable effort needs to be expended in detailed and carefully controlled experiments in low disturbance level, low velocity facilities equipped with high quality measuring instrumentation. Global investigations at high velocity in numerous facilities are needed, providing such quantities as flow quality (turbulence, noise, temperature disturbances) are well documented. Parallel theoretical investigations must be conducted in conjunction with the experimental effort.

AGARDograph 232
M.F.Coantic
July 1978
254 pages
ISBN 92-835-1284-7

An Introduction to Turbulence in Geophysics, and Air-Sea Interactions
Contents are based on detailed notes of a lecture presented in 1975 at the University of California, San Diego, updated as appropriate. This comprehensive review is unique and collectively provides a fundamental perspective on turbulence in geophysics and air-sea interactions which is not available elsewhere. The basic general equations governing the problem are presented and discussed, experimental methods are reviewed, the planetary boundary-layer is discussed and modeled, and the interaction between turbulence and radiation is covered. The Fluid Dynamic Panel of AGARD supported the publication of this effort in the belief that it is a valuable reference document of value to the scientific community.

AGARDograph 236
M.V.Morkovin
July 1978
38 pages
ISBN 92-835-1288-X

Instability, Transition to Turbulence and Predictability
Contained herein is a concise state-of-the-art review and perspective on the phenomenon of transition which constituted the "Opening Address" at the Fluid Dynamics Panel Symposium on "Laminar-Turbulent Transition" (AGARD-CP-224) held in Lyngby, Denmark, 2–4 May 1977. Various instability mechanisms leading to transition are proposed and discussed. A valuable insight is provided based on existing experimental evidence and postulated flow structures. Critical questions are asked relating to the conceptual foundations on which much of the transitional effort is based. To enhance our understanding of the basic mechanisms and processes, detailed microscopic experiments are encouraged to increase the data base.

Conference Preprint 247
September 1978
240 pages

High Angle of Attack Aerodynamics
Preprints of papers delivered at Panel Symposium, Sandefjord, October 1978.

Advisory Report 125
Rimantas Liaugminas
September 1978
18 pages
ISBN 92-835-1296-0

Technical Evaluation Report on the Fluid Dynamics Panel Symposium on Prediction of Aerodynamic Loading
The Symposium was primarily concerned with the fluid dynamic aspects of predicting aerodynamic loads that represent difficult design and operating problems. Emphasis was on theoretical and semi-empirical methods for determining the level and distribution of the expected loading and on assessing and evaluating the accuracy of the predicted values through comparison with available experimental data from wind-tunnels and flight tests. The evaluation report summarizes the advances in the state-of-art of aerodynamic load prediction represented by the conference papers and discussion and indicates unsolved problem areas for further research effort. The Symposium was held on 27–29 September 1976, at the National Aeronautics and Space Administration, Ames Research Center, Moffett Field, California. The Proceedings are published as AGARD-CP-204, dated February, 1977 (ISBN 92-835-1238-4).

Advisory Report 128
H.Bergh
October 1978
8 pages
ISBN 92-835-1300-2

Technical Evaluation Report on the Fluid Dynamics Panel Symposium on Unsteady Aerodynamics
The Symposium demonstrated the different stages of development in the broad field of unsteady aerodynamics. Satisfactory tools are available for the subsonic and supersonic speed regime with attached flow. Understanding has been improved in unsteady transonic aerodynamics, but the need for high Reynolds number transonic facility capability is evident. Difficulty in correlation of work in fixed wing and helicopter attached/separated flow problems is noted. Unsteady flows associated with rotors, cascades and turbomachinery require more attention, and the common interests of structural aeroelasticians in unsteady aerodynamics calls for more collaboration with aerodynamicists.

Conference Proceedings 235
November 1978
636 pages
ISBN 92-835-0223-X

Dynamic Stability Parameters

The Symposium discussed the specific needs for dynamic stability information of of aerospace vehicles, the form in which it should be presented and the various means of obtaining it.

The modern aerospace vehicle is often exposed to unsteady, irregular or asymmetrical flow fields that may have significant effects on its characteristics of motion. This is caused by the fact that the flight envelope of a present-day military aircraft or missile often encompasses flight at high angles of attack, flight at non-zero sideslip angles and the ability to perform translational maneuvers.

The Symposium included reports on new developments in wind-tunnel, flight test, and analytical techniques; motion analysis and non-linear formulations; and sensitivity and simulator studies. Specialists discussed a broad spectrum of approaches to determination of dynamic stability parameters.

Advisory Report 127
November 1978
140 pages
ISBN 92-835-1302-9

Aircraft Icing

Icing of unprotected aircraft components is a major problem engineers are faced with during the development phase of an aircraft programme. Ice accretions as well as their shape have to be predicted in order to investigate their effect on aerodynamic flight safety and performance and to decide on the need for anti- or de-icing systems. The Fluid Dynamics Panel of AGARD sponsored a round-table discussion on the subject of Aircraft Icing on 30 September 1977, in Ottawa, Canada, in conjunction with an FDP Symposium on Unsteady Aerodynamics. The seven papers presented, covering a broad spectrum of topics, are presented in this Advisory Report.

GUIDANCE AND CONTROL PANEL (GCP)

Conference Proceedings 220
February 1978
292 pages
ISBN 92-835-0211-6

Applications of Advances in Navigation to Guidance and Control

These Proceedings consist of twenty-two papers contained in the programme of the AGARD Guidance and Control Panel Symposium held in Stuttgart, Germany, 10–13 May 1977. The papers are grouped under the following session titles: Keynote Session – I: Improvements in Inertial Navigation Systems and their Applications – II: Improvements in Radar and Radio Navigation Aids and their Applications – III: Specific Functions and System Concepts – IV: New Major Systems – V: System Improvements and Concepts.

A Technical Evaluation Report on the Symposium is published separately as AGARD Advisory Report No.115.

Conference Proceedings 240
April 1978
330 pages
ISBN 92-835-1278-2

Guidance and Control Design Considerations for Low-Altitude and Terminal-Area Flight

The Proceedings include papers presented at a symposium of the AGARD Guidance and Control Panel, held in Dayton, Ohio, USA, 17–20 October 1977. Twenty six papers were presented on the following topics: Operational Problems and Considerations, Terrain Following, Terminal-Area and Landing Considerations, Weapon Delivery, System Integration.

Conference Proceedings 240
(Supplement)
(Classified)
June 1978
14 pages

Guidance and Control Design Considerations for Low-Altitude and Terminal-Area Flight

This publication is a classified supplement to AGARD Conference Proceedings No.240. The main unclassified volume contains 25 papers on the following topics: Operational Problems and Considerations, Terrain Following, Terminal-Area and Landing Considerations, Weapon Delivery, System Integration.

Advisory Report 115
June 1978
12 pages
ISBN 92-835-1281-2

Technical Evaluation Report on the 24th Guidance and Control Panel Technical Meeting: Symposium on Applications of Advances in Navigation to Guidance and Control

The GCP Symposium was held in Stuttgart, Germany, 10–13 May, 1977. The program as presented at the symposium is appended to this report. The complete compilation of papers has been published as Conference Proceedings CP-220.

The technical evaluation for each session has been done mainly by the session chairmen and edited by the program chairman. The evaluation includes most of the comments and recommendations which were received from the participants in the symposium.

AGARDograph 234
P.R.Kurzhals (Editor)
November 1978
184 pages
ISBN 92-835-0225-6

Active Controls in Aircraft Design
Active controls offer the promise of significantly increased aircraft performance and operational capability. However, realization of these gains will require major changes in both the aircraft design approach and in the implementation of the flight control system. This AGARDograph addresses related control-configured vehicle design and system considerations and summarizes representative applications of active control for fighter and transport aircraft.

Conference Proceedings 257
December 1978
248 pages
ISBN 92-835-1303-7

The Impact of Integrated Guidance and Control Technology on Weapons Systems Design
These Proceedings relate to a symposium of the Guidance and Control Panel held in Sandefjord, Norway, in May 1978.

Twenty seven papers (not all cleared for publication) were presented on the following topics:

- Functional Design, Concepts, Requirements and Trends
- Weapon Delivery/Flight Control Integration
- Communications, Command, Control (C^3) and Sensor Data Integration
- Crew Station Configurations and Display Concepts
- Pilot/System Interaction
- Data Processing and Distribution Systems
- Development and System Test Experiences

Conference Proceedings 257
(Supplement)
(Classified)
December 1978

The Impact of Integrated Guidance and Control Technology on Weapons Systems Design
This Supplement contains the classified papers not included in the main Conference Proceedings.

PROPULSION AND ENERGETICS PANEL (PEP)

Conference Proceedings 229
February 1978
602 pages
ISBN 92-835-0209-4

High-Temperature Problems in Gas Turbine Engines
These Conference Proceedings contain 39 papers presented at the 50th Meeting of the AGARD Propulsion and Energetics Panel, held at Ankara, Turkey on 19–23 September 1977. The papers were grouped into eight sessions on motivation and survey, turbine cooling techniques, combustors, afterburners and nozzles, materials and coatings, mechanical problems, effect of cooling and aerodynamic performance, measuring techniques, and on prediction methods.

The purpose of this meeting was to review and highlight the main problems associated with the attainment of high temperatures in aircraft gas turbines. Attention was focussed on methods of cooling components in the hot portion of the engine, notably the combustor and reheat liners, nozzle guide vanes and turbine components. Progress in new materials and protective coatings was discussed. Fuel and combustion problems associated with operation at high gas temperatures were considered as well. Furthermore new measuring techniques and heat transfer prediction methods were discussed.

Also included are the Technical Evaluation Report and the discussions which took place after most of the presentations.

Advisory Report 116
R.Eggebrecht and S.Lombardo
March 1978
18 pages
ISBN 82-835-1277-4

Technical Evaluation Report on the 50th Meeting of the Propulsion and Energetics Panel – A Symposium on High-Temperature Problems in Gas Turbine Engines
This Technical Evaluation Report on the 50th PEP Symposium on "High-Temperature Problems in Gas Turbine Engines" contains a critical survey of the 39 papers presented, which are grouped according to the various subjects covered in this Symposium. (Progress of New Research and Development Test Facilities, Cooling Techniques and Heat Transfer Investigations, Effect of Turbine Cooling on Aerodynamic Performance, Combustors and Afterburners, High Temperature Materials and Coatings, Overall Engine Design and Performance Aspects.) Conclusions are drawn and areas with high-priority future interest are marked.

The papers presented at the meeting, together with the discussions, are published as AGARD Conference Proceedings CP-229 "High-Temperature Problems in Gas Turbine Engines".

Conference Preprint 236
March 1978
38 pages

Icing Testing for Aircraft Engines
See Conference Proceedings 236 below.

Conference Preprint 237
March 1978
120 pages

Seal Technology in Gas Turbine Engines
See Conference Proceedings 237 below.

Advisory Report 101
Volume II (Eng)
(Classified)
May 1978
140 pages

Propulsion and Power Supplies for Unmanned Vehicles – Small RPV's Powered by Turbojet or Turbofan

This document contains the report on small, remotely piloted, turbojet or turbofan propelled vehicles, prepared by Sub-Group B of Working Group 06 for the AGARD Propulsion and Energetics Panel.

One of the first tasks to be accomplished was the selection of the various missions for which a turbojet or turbofan engine seemed to be a suitable power plant. This selection, based on propulsion requirements, was derived from various national proposals; it led to the following four types of mission: reconnaissance, attack, target drone, and target designation/electromagnetic counter-measures.

The present document includes a detailed study of each of the four above missions, especially as regards:

- the availability and suitability of existing engines for use on the vehicle fitted for the mission;
- the possible need for developing new engines, and the impact of new technologies on the mission performance and costs.

This report also provides a review of existing turbojets and turbofans with thrusts lower than 2500 daN. The catalogue includes 124 engines (either in the production, or development, or project stage) and presents a considerable amount of statistically processed data.

The report concludes with recommendations for research on, or development of turbojets or turbofans, either to fill existing gaps, or to improve both performance and changes of carrying out the various missions considered.

Rapport Consultatif 101
Volume II (FR)
(Classified)
Mai 1978
142 pages

Propulsion et Fourniture de Puissance pour les Véhicules sans Pilote – Petits Véhicules Télépilotés Propulses par Turboréacteur ou Turbosoufflante

Le présent document contient le rapport sur les petits véhicules télépilotés par des turboréacteurs ou des turbosoufflantes, préparés par le Sous-Groupe B du Groupe de Travail 06, pour le Panel "Propulsion et Energetique" de l'AGARD.

L'une des premières tâches a consisté à choisir les différentes missions pour lesquelles le turboréacteur ou la turbosoufflante semblait approprié comme propulseur. Ce choix, opéré à partir de différentes propositions nationales, a conduit à retenir, du point de vue des exigences de la propulsion, quatre types de mission suivantes: reconnaissance; attaque; engin cible; désignation d'objectif/contre-mesures électromagnetiques.

Le présent document contient une étude détaillée de chacune des quatres missions ci-dessus. On a examiné en particulier pour chaque mission:

- la disponibilité et la convenance de moteurs existants pour utilisation sur le véhicule apte à remplir la mission;
- le besoin éventuel de développer de nouveaux types de moteurs et l'influence de nouvelles technologies sur les performances et le coût de la mission.

On trouvera également dans ce rapport un examen critique de turboréacteurs et turbosoufflantes existants de poussée inférieure à 2500 daN. Le catalogue comprend 124 moteurs (en production, en cours de développement ou projets) et contient de très nombreuses informations qui on été traitées statistiquement.

Enfin, le rapport se termine par des conclusions sur les recherches ou développements recommandés sur des turboréacteurs ou soufflantes, soit pour combler des lacunes, soit pour améliorer les performances ou les chances de remplir les différentes missions etudiées.

Advisory Report 101
Volume III
(Classified)
June 1978
82 pages

Propulsion Systems for False Targets

The current state of the art in propulsion, suitable for false targets, is described. Recommendations are made regarding future activities for research and for further studies.

Attention is focussed on missions which are of interest to NATO: these missions are analysed in some detail. A review of available propulsion devices is made, and it is shown that all missions of interest to NATO can be achieved with existing propulsion devices, although in some cases improvements would accrue from development of new propulsors. The missions of interest to NATO require a diverse range of types and sizes of propulsion means. The proportion of the vehicle cost attributable to propulsion is dependent on the type of propulsion and on the mission.

It is shown that the false target concept could well be feasible on an operationally cost-effective basis, although further work, outside the scope of this document, is required to quantify this.

Advisory Report 123
B.Wrigley
July 1978
10 pages
ISBN 92-835-1289-8

Technical Evaluation Report on the 51st (B) Specialists' Meeting of the Propulsion and Energetics Panel on Seal Technology in Gas Turbine Engines

This Technical Evaluation Report on the 51st (B) PEP Specialists' Meeting on "Seal Technology in Gas Turbine Engines" surveys critically the 17 papers presented at the meeting and the final Round Table Discussion. An overview on the present status of the employed technology and its shortcomings is reached as well as an overview on the current developments in the field. It is placed within the context of engine operating and maintenance costs and engine design including its relation to the mechanical and aerodynamic performance of engines. Conclusions are drawn and recommendations are given whereto future interest should be directed.

The papers and discussions presented at the 51st (B) Specialists' Meeting of the Propulsion and Energetics Panel which was held at Church House, Westminster, London, UK on 6 and 7 April 1978, will be published as AGARD Conference Proceedings CP-237.

Advisory Report 124
D.Tedstone
August 1978
8 pages
ISBN 92-835-1295-2

Technical Evaluation Report on the 51st (A) Specialists' Meeting of the Propulsion and Energetics Panel on Icing Testing for Aircraft Engines

This Technical Evaluation Report on the Propulsion and Energetics 51st (A) Specialists' Meeting on Icing Testing for Aircraft Engines contains a survey of the thirteen papers presented, and of the discussions which followed each paper, as well as of the concluding Round Table Session. Conclusions are drawn and recommendations made regarding future work.

Conference Proceedings 236
August 1978
212 pages
ISBN 92-835-0217-5

Icing Testing for Aircraft Engines

The Conference Proceedings contain the papers presented and the discussions held at the Propulsion and Energetics Panel's 51st (A) Specialists' Meeting which was convened at Church House, Westminster, London, UK on 3 and 4 April 1978. The Technical Evaluation Report on this meeting is also included.

Thirteen papers were presented. During the first session, three papers dealt with meteorological icing conditions, the microphysical structure of icing clouds and measurement of snow concentration. Icing test facilities and their instrumentation currently used in the US, UK and France were reported in the second session, while the third session contained six papers on experiences of different kinds: measurement systems, icing of aircraft engines either installed in aircraft and helicopters, or when taken into test facilities. The Round Table Discussion and the Technical Evaluation Report identify the survey achieved by this meeting and the conclusions to be drawn for future work.

Conference Proceedings 237
August 1978
286 pages
ISBN 92-835-0218-3

Seal Technology in Gas Turbine Engines

These Conference Proceedings contain 17 papers presented at the 51st (B) Specialists' Meeting of the AGARD Propulsion and Energetics Panel, held at Church House, Westminster, London, UK on 6 and 7 April 1978.

The papers were grouped into six sessions: Survey, Material Technology, User's View of Seal Technology, Measurements of Seal Behaviour, Laboratory Experiments, and Design Aids. The meeting was concluded with a Round Table Discussion. This discussion as well as those after each presentation, and the Technical Evaluation Report are included in the Conference Proceedings.

The purpose of the meeting was to provide a forum to discuss technology of gas turbine engine seals. The discussion was limited to cases where relative motion exists between parts of seals. Both gas path and oil path seals were covered. Due to relevant and timely contributions on overview on the present status and the shortcomings of seal technology is reached as well as on the current developments. Various aspects were taken into account like engine operating and maintenance costs, and the engine design procedure. Within the Round Table Discussion and even more extensively in the Technical Evaluation Report conclusions are drawn and recommendations are given whereto future interest should be directed.

Conference Preprint 248
October 1978
272 pages

Stresses, Vibrations, Structural Integration and Engine Integrity (including Aeroelasticity and Flutter)

Preprints of papers presented at Panel Meeting, Cleveland, October 1978.

Advisory Report 111
S.S.Penner
November 1978
34 pages
ISBN 92-835-1258-8

The AGARD Propulsion and Energetics Panel: 1952–1977
This Advisory Report summarizes the work done during the past 25 years by the AGARD Propulsion and Energetics Panel formerly named Combustion and Propulsion Panel, and initially, Combustion Panel. It analyses the adaptation of the Panel to new challenging demands of propulsion technology and the impact of Panel activities on Research and Development within NATO countries. Based on this survey and his experience, the author proposes again a move in future Panel activities, particularly long term emphasis of energy related topics. In addition, proposals on AGARD publication and publicity policy are included.

STRUCTURES AND MATERIALS PANEL (SMP)

AGARDograph 231
January 1978
140 pages
ISBN 92-835-1271-5

Fatigue Design of Fighters
In the past fatigue has not been a particularly important aspect in the design of fighter aircraft structures. Being required to sustain high manoeuvring loads and being of relatively short life expectancy, these structures were generally designed primarily by static strength considerations. More recently, the greater complexity and cost of new weapon systems, together with the general economic pressures to control defence expenditure in the NATO countries, has required that the operational lives of fighters be increased bringing in its train an increased probability of fatigue defects and failures. Apart from the safety aspects, these fatigue defects can cause a reduction in the total state of readiness of the NATO air forces and, with the more sophisticated materials and structural forms now being employed, can result in expensive repair bills.

Recognising this situation, the Structures and Materials Panel of AGARD have explored this area of concern and have proposed, wherever possible, generally accepted procedures for its solution. The AGARDograph on Fatigue Design of Fighters provides such guidelines for obtaining and monitoring adequate fatigue performance of fighter aircraft. It is commended to the structural designers, the procurement agencies, the safety agencies and the air forces in the expectation that the wider adoption of the procedures described will result in overall improvements in the cost-effectiveness of new fighter aircraft structures.

Report 660
January 1978
40 pages
ISBN 92-835-0208-6

Certification Procedures for Composite Structures
Certification is the procedure which provides the possibility of making certain that any aircraft, whether civil or military, has an acceptable safety level for a given future utilization. For metallic structures, it is expressed as a set of rules which, from experience, it has been possible to transform into numerical specifications.

Composite materials, the advent of which is too recent for calculated data yet to be generalised, do however offer a number of very specific characteristics which are quite often rather imperfectly understood.

Consequently, the four papers which are included in this Report do not claim to provide certification principles in the form of regulations. For the time being, they describe various conservative approaches which, through experimental programmes which are often most impressive, have retained two simultaneous major objectives.

1. firstly, to fly a certain number of high performance aircraft structures, without major risk.
2. to accumulate experimental technical data which will help to define general safety factors, defect tolerances, propagation criteria and critical thresholds so as to have available a set of rules limiting and describing accurately the necessary physical checks and testing.

Four papers presented at the 44th Meeting of the Structures and Materials Panel of AGARD, April 1977.

Report 663
P.Santini, A.Castellani and A.Nappi
January 1978
24 pages
ISBN 92-835-1268-5

An Introduction to the Problem of Dynamic Structural Damping
In the design of aerospace structures, damping plays a fundamental role. Lack of knowledge of the damping ratio can result in either serious damage to the structure or over-dimensioned structure. The problem of determination of damping ratios is not yet resolved.

Report indicates some fundamental aspects of the problem:

- the fields where damping is crucial,
- the types of structure involved,
- materials,
- mathematical simulation,
- test methods.

A bibliographic survey of numerical values completes the Report.

Papers presented at the 45th Structures and Materials Panel Meeting, Voss, Norway, September 1977.

Report 664
W.Lansing, E.Lerner and R.F.Taylor
January 1978
26 pages
ISBN 92-835-1269-3

Applications of Structural Optimization for Strength and Aeroelastic Design Requirements

The purpose of this paper is to review the progress that has been made in structural optimization techniques during the last few years. The paper concentrates on the use of optimization in the design of structures from the point of view of aeroelasticity, taking into account the constraints due to loads. It gives a survey of the efforts that have been achieved in the main US firms and organizations and shows that most of the techniques are now at the stage where they are used, or can be used, for actual design.

Paper presented at the 45th Structures and Materials Panel Meeting, Voss, Norway, September 1977.

Report 665
E.Breitbach
Jaunary 1978
18 pages
ISBN 92-835-1270-7

Effects of Structural Non-Linearities on Aircraft Vibration and Flutter

Work on flutter prediction has always been based on the modal representation of the structure, which implies a linear model of the aircraft. A number of good results have been obtained, for many prototypes, using this method. Unfortunately, more and more difficulties have appeared during the last few years, both for aircraft carrying large stores and for light aircraft, where non-linear phenomena made it hazardous to use a linear approach. This paper presents a possibility for taking into account some non-linearities of the structure and their effect on flutter. It is considered to be an important milestone in accurate flutter prediction in complicated conditions.

Paper presented at the 45th Structures and Materials Panel Meeting, Voss, Norway, September 1977.

Conference Proceedings 234
March 1978
350 pages
ISBN 92-835-0213-2

***Non-Destructive* Inspection Relationships to Aircraft Design Materials**

Because the existence of poor communications and limited rate of integration among materials technologists, design engineers and NDI experts was realized by AGARD, the Structures and Materials Panel took the initiative of organizing a Specialists' Meeting at which 20 papers were presented. These papers covered the state-of-the-art for NDI methods for materials of interest to the aerospace industry, the weak points of some methods used at present, the trends of application of known methods and a few new methods. The situation does not appear to be satisfactory in the fields of composite materials and of ceramic materials for turbine engine hot components where much work remains to be done. In the area of metallic materials, the trend is towards automatic inspection, development of smart sensors and in-process inspection. A few new methods (low angle neutron scattering, digitalized infra-red thermography, tomography, acoustical emission, multifrequency eddy currents, very high frequency ultrasonic beam scattering) deserve appropriate consideration.

Papers presented at the 45th Meeting of the AGARD Structures and Materials Panel held in Voss, Norway, 27–28 September 1977.

***Advisory Report* 108**
W.J.Mykytow, B.Laschka and J.J.Olsen
April 1978
84 pages
ISBN 92-835-1279-0

Technical Evaluation Report of the Specialists' Meeting on Unsteady Airloads in Separated and Transonic Flow

The Specialists' Meeting held on 19–20 April 1977, consisted of two Sessions on "Airframe Response to Separated Flow" and "Transonic Unsteady Aerodynamics for Aeroelastic Phenomena" respectively. The first Session reviewed the prediction and description of the separated flow environment and the essential effects of airframe response on individual aircraft components. The second Session dealt with flutter, aeroservoelastic instabilities involving coupling with active control systems and other static and dynamic aeroelastic problems, with specific reference to the transonic speed range.

The Proceedings of the Specialists' Meeting are published as Conference Proceedings No.226. This Technical Report assesses the Meeting, summarises the presentations and discussions, and makes recommendations for future work in this area.

Report 667
June 1978
34 pages
ISBN 92-835-1286-3

Combat Damage Tolerance and Repair of Aircraft Structures

The tolerance of the structure to various threats and the probability of the aircraft surviving the impact, completing the mission and returning safely to base is only part of the problem of maintaining an adequate defence capability. An aircraft is still "lost" as an effective part of the air force if it proves impossible to repair the damage quickly, particularly in the context of a short duration conflict. Vitally important

are the methods of rapid inspection and assessment of the damage to determine the extent of repair required or if repair may safely be deferred. Thus the total number of aircraft required to meet a given military situation is determined at least in part by their combat damage tolerance and repair characteristics; improvements in these characteristics can produce real reductions in defence cotst. The Structures and Materials Panel of AGARD reviewed these questions at its meeting in April 1978. Three papers were presented, and are reproduced here, giving an overview of the present situation and directing attention to the areas most needing further work.

Papers presented at the 46th Structures and Materials Panel Meeting, Aalborg, Denmark, April 1978.

Report 668
July 1978
42 pages
ISBN 92-835-1290-1

Considerations on Wing Stores Flutter – Asymmetry – Flutter Suppression

Air Forces in many countries have to face problems of aeroelasticity and flutter with aircraft carrying more and more stores. The two papers of the Report presented to the Sub-Committee on Aeroelasticity of the Structures and Materials Panel during the 46th Meeting of the Panel deal with two different aspects of the problem.

– The paper of A.Lotze is concerned with the many configurations, symmetric or asymmetric, that may occur and with their consequences on the natural modes of the structure. It clarifies the difficulties one has to face to clear the flight domain for all flight configurations and proposes useful approaches.

– The paper of C.Hwang, B.A.Winther, T.E.Noll and M.G.Farmer deals with the difficult problem of flutter suppression; it exposes the approach, the design, and the wind tunnel tests of the model of a fighter, carrying stores and equipped with a flutter suppression device.

The two papers are of great interest to aeroelasticians and may give useful help to the designer.

Conference Proceedings 243
August 1978
362 pages
ISBN 92-835-0220-5

Characterization of Low Cycle High Temperature Fatigue by the Strainrange Partitioning Method

This Specialists' Meeting brought together the principal participants in a cooperative testing programme aimed at the evaluation of the strainrange partitioning approach to the analysis and prediction of low cycle high temperature fatigue life. A number of laboratories in several countries participated in this programme, each testing its own materials of interest under its own laboratory conditions to ensure that the results obtained would provide validation for a wide range of aerospace materials and to ensure maximum usefulness to each participating laboratory.

Papers presented at the 46th Meeting of the AGARD Structures and Materials Panel held in Aalborg, Denmark on 11–12 April 1978.

Manuel 10 (FR)
W.G.Barrois
Decembre 1978
122 pages
ISBN 92-835-2105-6

Manuel sur la Fatigue des Structures

La presente publication comprend le chapitre 7 qui traite de l'endommagement de surface dues à des causes mécaniques telles que frottement d'une roue en rotation, usure, *fatigue due au roulement, fatigue par contact, fatigue par frottement, et* érosion sous l'action de particules solides ou liquides. L'endommagement de cette nature est fréquemment à l'origine de fissures de fatigue. L'autre s'efforce de *présenter, sous forme résumée, les aspects des connaissance scientifiques relatives à* ce domaine qui s'appliquent particulièrement au processus de conception des structures. Nous espérons qu'une complète appréciation et une utilisation attentive de ces informations par les ingénieurs concepteurs permettront d'améliorer de façon significative la résistance de nos futurs véhicules aux facteurs d'environnement, et, par conséquent, de réduire dans une large mesure les coûts et la maintenance, et d'augmenter la disponibilité des avions.

TECHNICAL INFORMATION PANEL (TIP)

AGARDograph 235
Volume I
S.C.Schuler (General Editor)
August 1978
70 pages
ISBN 92-835-1291-X

Manual of Documentation Practices Applicable to Defence-Aerospace Scientific and Technical Information – Volume I: Acquisition and Sources, Descriptive Cataloguing, Abstracting and Subject Analysis

The first of four separately published volumes describing the basic documentation practices involved in the initial setting up and operation of an Information-Library organisation to provide defence-aerospace information services.

The focus is on a practical, rather than theoretical, approach for both the senior person setting up a new system, as well as junior staff who may be using the manual as a training aid.

The three sections in this volume mainly cover the experience of documentation organizations in the USA and provide an overview of the processes and techniques involved. Examples and guidelines for implementation are given and staffing requirements are discussed.

Publication of the remaining volumes will be spread over the next three years.

Report 669
H.E.Sauter
October 1978
10 pages
ISBN 92-835-1298-7

Suggested Data Elements for Recording On-Going Research and Development Efforts: A Management Information System

The report considers how best to record for general dissemination the results of on-going research and development (R & D) work. Specifically, it seeks to:

- establish and define the level at which reporting takes place
- identify and define data elements for reporting R & D work programmes at local, national, and international levels, and
- encourage the establishment of working groups to effect the standardisation of these data elements.

Conference Preprint 246
October 1978
72 pages

Information and Industry

Preprints of papers delivered at Specialists' Meeting, Paris, October 1978.

LECTURE SERIES

Lecture Series 94
February 1978
250 pages
ISBN 92-835-0210-8

Three Dimensional and Unsteady Separation at High Reynolds Numbers

This Lecture Series will be devoted to two major aspects of the topic: the physics of flow separation and reattachment, with particular reference to turbulent flows, and a consideration of some practically important types of separated flows which occur in aeronautics. Under both headings lectures will be included on the most recent experimental work, computational techniques and prediction methods, and an attempt made to assess progress and to identify those areas in which further work should be done. Although attention will not be confined to incompressible flows, it is intended that only passing reference should be made to shock-wave boundary layer interaction.

The material in this publication was assembled to support a Lecture Series under the sponsorship of the Fluid Dynamics Panel and the Consultant and Exchange Programme of AGARD presented on 20–24 February at the Von Kármán Institute, Rhode-Saint-Genèse, Belgium.

Lecture Series 92
March 1978
94 pages
ISBN 92-835-1276-6

The Application of Inexpensive Minicomputers to Information Work

Minicomputers are now extremely powerful and can be equipped with large access stores. These features make them ideally suited to information work and their cost is sufficiently low that an information centre or service can even justify having one solely for its own use. This avoids all the problems inherent in the sharing of a main frame computer, either in an associated organization or at a commercial bureau.

This Lecture Series outlines the ways in which many computers can be used in information work and includes examples of their current use in a number of different areas, such as editing and publishing information bulletins, SDI and retrospective retrieval and library housekeeping.

The material in this publication was assembled to support a Lecture Series under the sponsorship of the Technical Information Panel and the Consultant and Exchange Programme of AGARD, presented on 17–18 April 1978 in Delft, Netherlands and 20–21 April 1978 in Ankara, Turkey.

Lecture Series 93
April 1978
247 pages including
Bibliography of 104 items
ISBN 92-835-1280-4

Recent Advances in Radio and Optical Propagation for Modern Communications, Navigation and Detection Systems

After an introduction to optical problems of systems the following are presented: physics of incoherent optical propagation, problems relative to laser transmission, remote sensing (IR, UV Microwave).

The radio wave propagation lectures include high-frequency transmissions forecasting and prediction of ionospheric parameters, ionospheric time delay, ionospheric scintillation, artificial modification of the propagation medium, low and very low frequency propagation.

The material in this book has been assembled to support a Lecture Series presented in Oslo (8, 9 May 1978), London (11, 12 May 1978) and Rome (15, 16 May 1978),

under the joint sponsorship of the Electromagnetic Wave Propagation Panel and Consultant and Exchange Programme of AGARD.

Lecture Series 95
May 1978
278 pages
ISBN 92-835-0214-0

Strap-Down Inertial Systems

The state-of-the-art in strap-down inertial systems technology has advanced to a state where it seems timely to present it to the NATO Community in the form of a Lecture Series. Until now, this technology has been covered only in many separate papers, and no coherent document covering the whole spectrum of this technology is available.

The Lecture Series will provide an overview of the current technologies being implemented in strap-down navigation, control, and guidance systems. Technology high-lighting the up-to-date techniques employed in the development of inertial sensor, analysis, data-processing and subsystem integration will be discussed, along with predictions of the directions these techniques are likely to take. This will provide the overall background necessary for understanding the principles and mechanisms of real, current-day, strap-down systems and likely future systems using the newest technology.

The material in this publication was assembled to support a Lecture Series under the sponsorship of the Guidance and Control Panel and the Consultant and Exchange Programme of AGARD, and was presented on 6–7 June 1978 in London, UK; 9th June 1978 in Copenhagen, Denmark; 12–13 June 1978 in Bolkesjø, Norway; 15–16 June 1978 in Cologne, Germany, and 19–20 June 1978 in Rome, Italy.

Lecture Series 97 (Preprint)
August 1978
210 pages
ISBN 92-835-1294-4

Fracture Mechanics Design Methodology

Preprints of papers assembled to support a Lecture Series under the sponsorship of the Structures and Materials Panel and the Consultant and Exchange Programme of AGARD, presented on 5–6 October, 1978 in Delft, The Netherlands, 9–10 October, 1978 in Münich, Germany, and 12–13 October, 1978 in Sacauem, Portugal.

Lecture Series 96
September 1978
194 pages including
Bibliography of 61 items
ISBN 92-835-1297-9

Aircraft Engine Future Fuels and Energy Conservation

This AGARD Lecture Series No.96 is sponsored by the Propulsion and Energetics Panel of AGARD and is implemented by the Consultant and Exchange Programme.

Future fuel supplies for aviation is an important matter. If the world continues to consume its petroleum resources at its current rate of consumption, it will essentially run out of these resources by the turn of the century. The need for aircraft fuel conservation is most urgent, if not mandatory, because the future of aviation as we know it today, is at stake. This lecture series is designed to provide various interested members of NATO with a better understanding of the problems facing the aerospace community and to provide an opportunity to review and assess what steps can and are being taken to alleviate this international problem.

Current and forecasted world energy demands, growth, and supply are reviewed in perspective to the status and outlook for future aviation fuels to meet NATO needs. The special problems associated with the refining of aviation fuels from lower quality feedstocks (including fuel refined from coal, oil shale, and tar sands) and techniques for reducing energy consumption in refining processes are examined. Special attention is given to the chemistry and combustion characteristics of future hydrocarbon fuels and the impact of using these fuels in aircraft engines and fuel systems. An assessment is made as to what technology advancements are currently underway and what other advancements are needed with reference to engine components, engine systems, aircraft designs and operational procedures to help conserve fuel resources.

The material in this publication was assembled to support a Lecture Series under the sponsorship of the Propulsion and Energetics Panel and the Consultant and Exchange Programme of AGARD presented on 16–17 October, 1978 in Münich, Federal Republic of Germany, and 19–20 October, 1978 in London, UK. In addition, a one-day Round-Table Discussion was held in Paris, France on 13 October, 1978.

MILITARY COMMITTEE STUDIES (MCS)

Advisory Report 102
Volume I
(Classified)
June 1978
78 pages

Interception of Mach 3 Aircraft by Fighters

The study objectives were to identify (a) feasible Intercept Fighter Systems (consisting of Manned Aircraft with their Fire Control Systems and Air-to-Air Missiles) for the near term (1977–1985) and the long term (1985–2000); (b) tactics for the employment of these fighters; and (c) the most promising areas for R & D.

On the basis of parametric studies of the most important technical and operational factors, the Study concludes that it is possible to propose options for alternate solutions and to identify advantages and drawbacks of each potential solution.

This Study was conducted in response to a request from the North Atlantic Military Committee under the management of the Aerospace Applications Studies Committee, Dr J.Dathe, Chairman.

It consists of two volumes, Volume I "Executive Summary", and Volume II Appendices.

Advisory Report 102
Volume II
(Classified)
June 1978
56 pages

Interception of Mach 3 Aircraft by Fighters
Volume II of Advisory Report 102 on "Interception of Mach 3 Aircraft by Fighters" consists of 3 Appendices which support respectively Chapter 4, Chapter 5, and Chapter 6 of Volume I.

Advisory Report 91
Volume II
(Classified)
July 1978
214 pages

Techniques for Suppression of Radars Associated with SAMs – Main Report and Appendices
The study identifies and examines various techniques expected to be available in the 1980's for the suppression of radars associated with surface-to-air missiles for the purpose of reducing the vulnerability of NATO aircraft to SAMs.

The study concentrates on the two basic means of suppression, namely by destruction or by neutralization.

Neutralization covers the aspects of surveillance, target tracking, missile tracking, missile guidance, fuse, and availability status. In the area of destruction, weapon guidance systems are evaluated with attack variables such as range, warhead weight and type of attack. Included is a survey on future enemy SAMs and electronic intelligence. Recommendations include indications of preferred tactics and desired R & D.

The report includes a model for performing trade-off comparisons between the two means of suppression and highlights input data deficiencies. The expertise of the study group, enhanced by battle experience, is used to provide inputs to the model in order to portray some trends as well as demonstrate the utility of the model.

This study is published in two volumes.

AGARD HEADQUARTERS (HQ)

Bulletin 78/1:
January 1978
82 pages

Meetings – Publications – Membership
This issue of the AGARD Bulletin gave a schedule of meetings to be held in 1978, a list of publications issued in 1977 and a directory of AGARD members as of 1 January 1978.

March 1978
84 pages

Director's Annual Report to the North Atlantic Military Committee 1977
This Report covers the AGARD 1977 Technical Programme. Achievements are reported in terms of: the meetings which were held to bring together the leading personalities of the NATO nations in a particular field of science and technology for the common benefit of the NATO Community; publications initiated for the purpose of assisting member nations in the effective use of their research and development capabilities; and the budget that supported this stimulus to the advances in the aerospace sciences relevant to strengthening the common defence posture.

Highlights 78/1
March 1978
52 pages

This booklet is one of a series aimed at establishing a more direct and informal means of communications between members of the AGARD community and their friends in the international aerospace profession. Items for publication are invited from all interested readers, and it is hoped that the Highlights will contain articles on the future activities of AGARD and provide a forum for the discussion of matters relating to AGARD's activities.

April 1978
78 pages

AGARD Calendar of Selected Aeronautical and Space Meetings (May–December 1978)
This document, which it is intended to publish every six months, will usually cover the forthcoming 18-month period: This 'prototype' issue, however, covers six months only. As its title indicates, the Calendar contains details of a wide range of meetings, symposia, courses, etc., details of which were obtained from national and international

organizations concerned with aeronautical and space subjects. For each entry is given the date, location, title and sponsor, keywords (indicating the main topics to be covered), and a contact code for enquiries. The next issue, which has a limited distribution to AGARD members only, will appear in December 1978.

Bulletin 78/2
August 1978
34 pages

This Bulletin reported the content and scope of the 1979 AGARD Technical Programme approved during the AGARD National Delegates Board Meeting, March 1978.

***Highlights* 78/2**
September 1978
22 pages

See Highlights 78/1 above.

September 1978
21 pages

Terms of Reference and Topic Lists for AGARD Panels and Aerospace Applications Studies Committee
Each AGARD Technical Panel, of which there are nine, deals with a specific discipline or field of specialization within the broad spectrum of aerospace science and technology whereas the Aerospace Applications Studies Committee deals with systems-oriented studies which cross the boundaries of the disciplines of the individual Panels. The delineation of the areas of activity of the various Panels is set out in their Terms of Reference which are presented in this document. These Terms of Reference, and accompanying Topic Lists, have been formally approved by the AGARD National Delegates Board.

SECTION III

AGARD MEMBERSHIP LISTS

1 JANUARY 1979

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